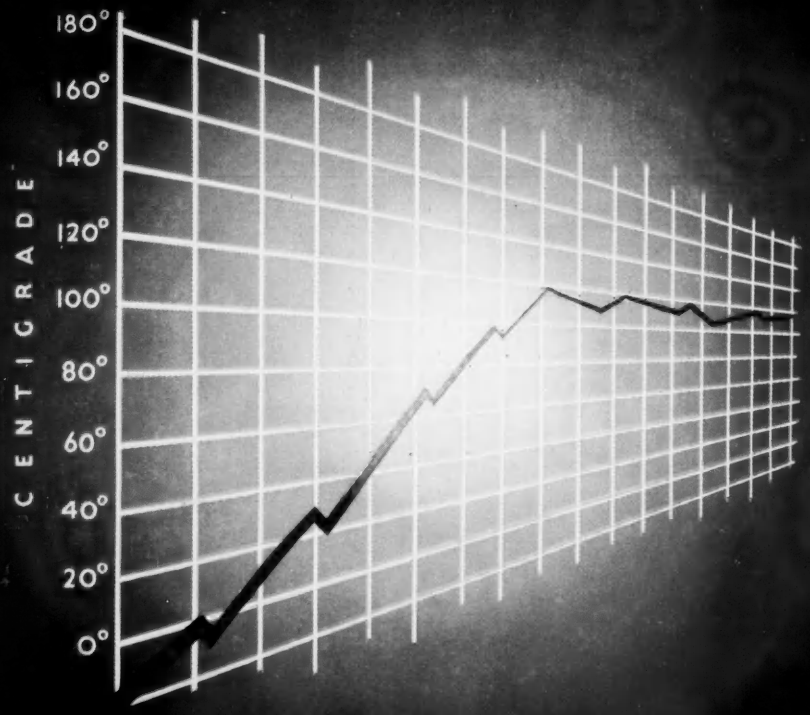
14 OCTOBER 1954

NINEPENCE

ELECTRICAL TIMES



FOR HOT INSTALLATIONS

BICC SILICONE RUBBER INSULATED CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET, LONDON, W.C.1

Send for publication No. 261

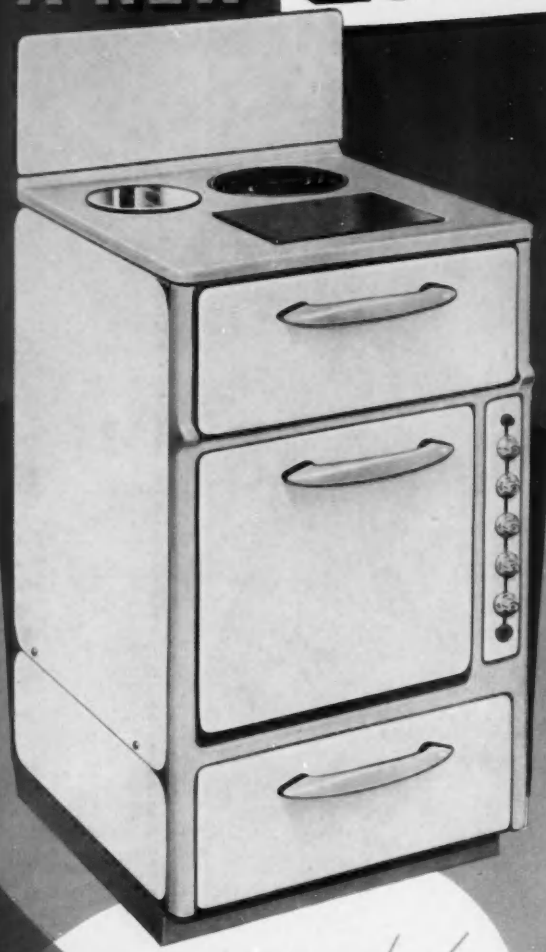
A NEW LUXURY COOKER

at a

COMPETITIVE PRICE

by

B·N·E



Model C. 90

Electric Cooker

With all the features of the popular C.49 — sound construction, cast iron main frame and hob, delightful colouring, drop down doors — PLUS

- A 'New Look' to match its wonderful performance
- Delightful pearl grey vitreous enamel interior
- Heated Storage Drawer
- Attention to every detail to ensure perfection
- Pyrex glass Casserole/Grill-pan
- and a quality of cooking that even surpasses the C.49

WITH THE AMAZING

SPEEDHEAT OVEN

HALVES PRE-HEATING TIME!

BRITISH NATIONAL ELECTRICS LTD.

The Domestic Appliance Section of **JOHNSON & PHILLIPS LTD.,**

NEWARTHILL · MOTHERWELL · SCOTLAND

L.S.E.
are good at supplying round pegs for round holes

The example shows L.S.E. 'floating' type squirrel-cage motors (designed for run-out table and similar drives which are very hard on rigidly mounted motors) adapted for a cooler bed application. They operate as gearless slow speed, variable speed motors from an L.S.E. "Speedmaster."

A large proportion of electric motor requirements can be met more or less exactly by one or other of a range of standard machines. Engineers who are not satisfied with an "or less" standard, however, find that L.S.E. can usually provide just the machine (and control equipment) for a job that is a little out of the ordinary.

LAURENCE, SCOTT & ELECTROMOTORS LIMITED

NORWICH - MANCHESTER - LONDON AND BRANCHES

A

WARM-GLOW ELECTRIC BLANKETS ARE *ALWAYS* BEST SELLERS

Serial No. ★ 2116
BRITISH
GOOD HOUSEKEEPING INSTITUTE
GUARANTEES
REFUND OF MONEY OR REPLACEMENT IF NOT IN CONFORMITY WITH THE INSTITUTE'S STANDARDS

VIGILUX *ELECTRIC* BLANKET

Pat. No. 671239

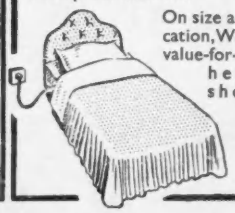
WITH FINGER-TIP BEDSIDE CONTROL

The only Blanket control which is infinitely variable, self-compensating and sensitive to bed and body temperatures. The VIGILUX (Regd.) has all the luxury features of the Warm-Glow single-heat Blanket — plus finger-tip bedside temperature control, and many other refinements. The full size woollen blanket is part of the bed-clothes and is not removed before retiring. Waterproof element and first class workmanship gives it a higher safety factor than any other blanket on the market. Shock-proof and washable.

WARM-GLOW *SINGLE HEAT* ELECTRIC BLANKET

Pat. No. 445195

WARM-GLOW were first to introduce natural dissipation control in 1934 and full size fleecy wool blankets in attractive pastel colours. In 1948 we were again first with the waterproof element.



On size and specification, Warm-Glow value-for-money is head and shoulders above all competitors.

and so are

WARM-GLOW SOIL HEATERS

They give reliable service with complete safety. They are of inestimable value to both amateur and professional gardeners. The price is less than half of any competitor. Designed for use in the standard cold frame but easily adapted to other sizes. Notable economy in greenhouses. Popular with all classes of gardeners.

ADVERTISEMENTS ARE APPEARING REGULARLY THIS AUTUMN & WINTER IN THE *DAILY EXPRESS, DAILY MAIL, DAILY TELEGRAPH, NEWS CHRONICLE, TIMES, SUNDAY CHRONICLE, SUNDAY DISPATCH, SUNDAY TIMES, EVERYBODY'S, ILLUSTRATED, PICTURE POST, PUNCH, &c.*

ASK YOUR WHOLESALER FOR FURTHER DETAILS OR WRITE TO DEPT. E.7

The WARM-GLOW Co. LTD. · LEIGH-ON-SEA · ESSEX · ENG.

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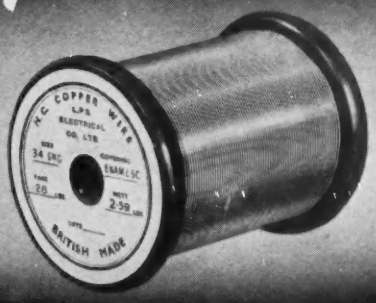
Dependability

INSTRUMENT WIRES
STRANDS & BRAIDS



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TELEPHONE PERIVALE 5621-4 TELEGRAMS ENGINEYOR PHONE LONDON

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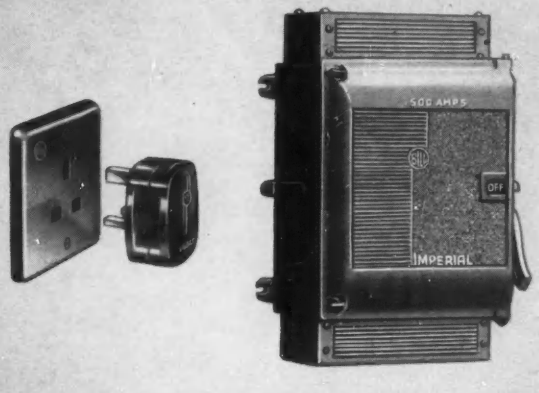
You cannot buy better gear



BILL COMPLETE RANGE
13 AMP SOCKET OUTLET TO 500 AMP FUSE SWITCH

★ SOCKET OUTLETS
★ COOKER SWITCHES
★ DISTRIBUTION BOARDS
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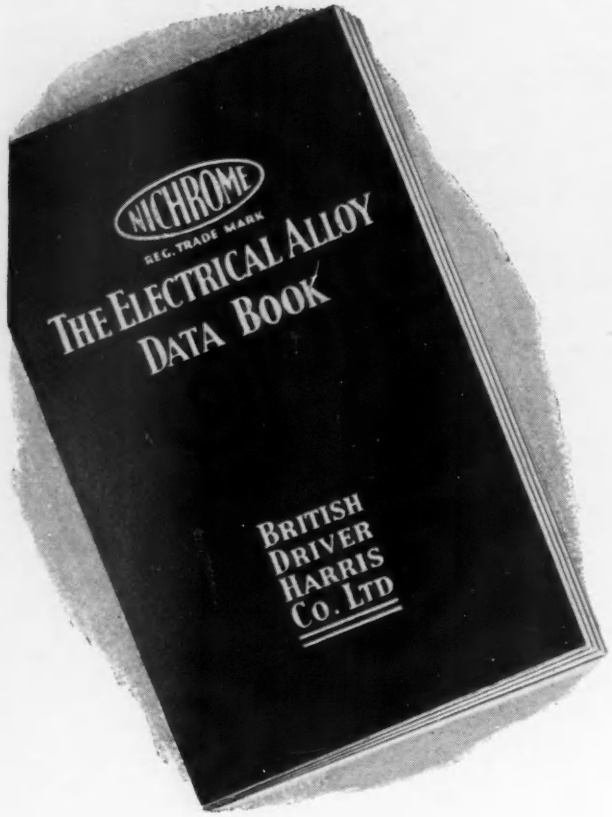

The book of technical data

The design and performance of electrical equipment, in both heating and resistance applications, depend largely upon the correct use of various alloys which may have widely differing properties. Information about these alloys is, we suggest, fundamental to manufacturers of electrical equipment, and this is conveniently available in detailed form in our technical data book, a copy of which may be had on application.

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MANCHESTER 15

THE GREATEST NAME IN ELECTRICAL RESISTANCE

Nickel and Nickel Alloy Specialists:—for furnace elements, domestic appliances, thermo-couples, telecommunications, lamps, spark plugs, fine wires, etc.

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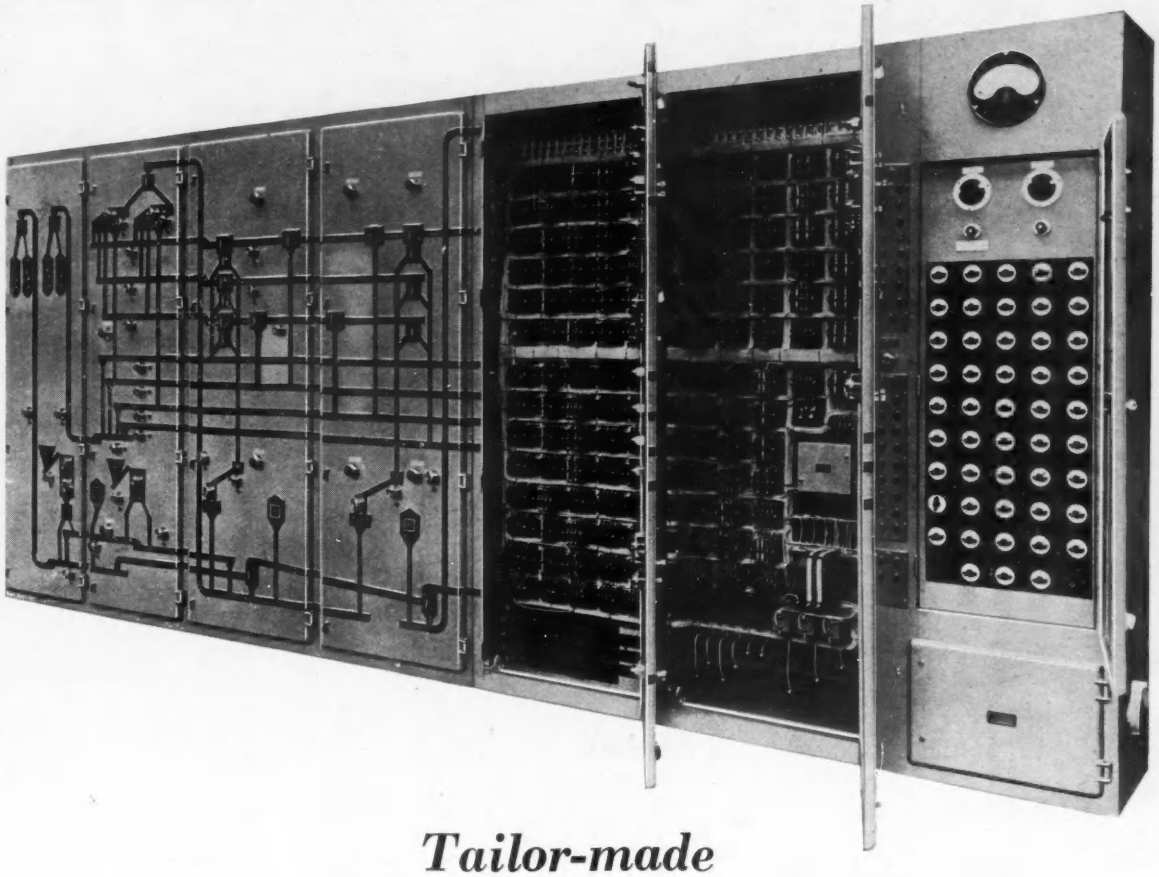

Tailor-made
MULTI-MOTOR EQUIPMENTS

The panel illustrated above was designed to provide selective sequence operation of a grinding and processing plant.
It allows fully automatic operation of 46 motors and 20 solenoid operated chutes, and by means of an illuminated mimic diagram on the front of the panel, gives a faithful representation of flow to 80 preselected processes.

This panel is typical of many multi-motor control equipments "tailor-made" to customers' special requirements. E.A.C. multi-motor automatic panels are giving yeoman service in air-conditioning, mechanical handling, wire drawing, refrigeration, pumping, foundry work, etc.
Have you a problem involving multi-motor control?

★ ***E.A.C. are the Single-phasing Preventor People***

THE ELECTRICAL APPARATUS COMPANY LTD · ST. ALBANS

LONDON · MANCHESTER · GLASGOW
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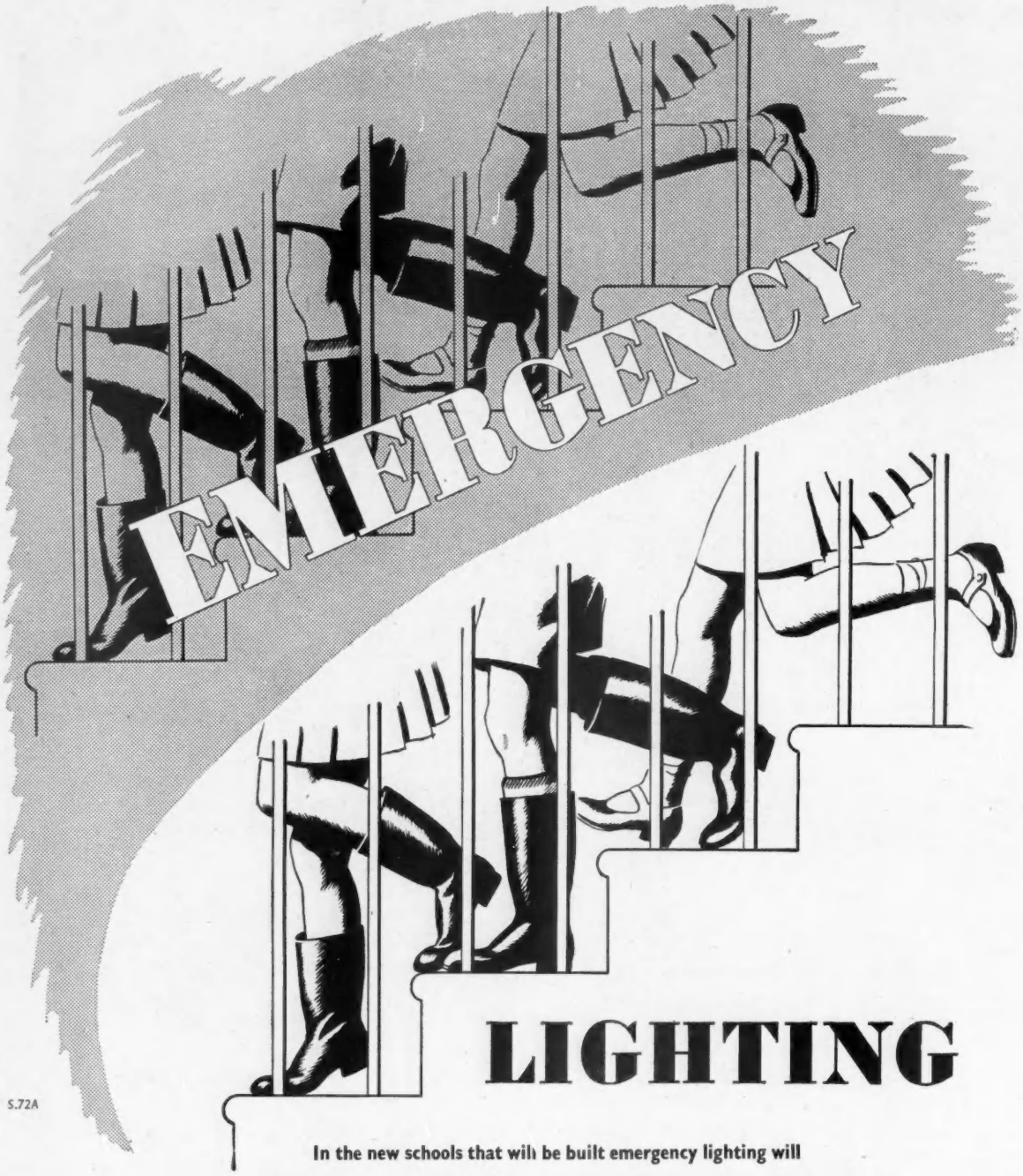
MAKERS OF MOTOR CONTROL GEAR AND INSTRUMENTS FOR NEARLY HALF A CENTURY



LIGHTING

S.72A

In the new schools that will be built emergency lighting will be installed. Not, it is hoped, as an afterthought. The installation of the standby system which guards against all the risks of mains interruption should be planned at the same time as the main lighting is planned. Chloride Batteries Limited, makers of Keepalite, the automatic emergency lighting system, offer the advisory services of their engineers to architects and electrical contractors in any part of Britain.

Keepalite

FOR SCHOOLS

A Product of Chloride Batteries Limited, Exide Works, Clifton Junction, Swinton, Manchester, and Grosvenor Gardens House, Grosvenor Gardens, SW1

A NEW NAME

cast in an old tradition of PERSONAL SERVICE

T. M. BIRKETT, BILLINGTON & NEWTON
LIMITED

The two famous firms of T. M. Birkett and Sons Ltd., and Billington and Newton Ltd., have pooled their unrivalled non-ferrous casting facilities and experience, to give the customers of each an *even better personal service.* The combined firms will operate from a new headquarters at Hanley, but foundries and machine shops will remain at Longport and Hanley.

Castings from a few ounces to 10 tons in phosphor-bronze, gun-metal, aluminium-bronze, manganese-bronze and light alloys. Precision-machined bushes and bearings. Specialists in high-tensile aluminium-bronze castings, centrifugal-cast wheel blanks, and chill-cast rods and tubes.

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One of Britain's Largest

NON-FERROUS

Foundries

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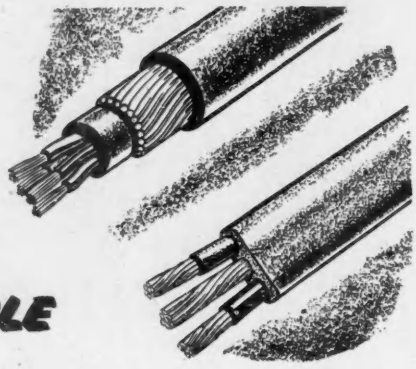
Hanley, Stoke-on-Trent. *Telephone : Stoke 22184*

A BETTER ELECTRICAL INSTALLATION AT LOWER COST WITH ASHATHENE CABLE



Ashathene polythene insulated and p.v.c. sheathed cable has outstanding and exclusive features which make it superior to V.I.R. and p.v.c. insulated cables. When you install Ashathene you ensure a safer electrical installation.

- HIGHER VOLTAGE INSULATION
- HIGHER DIELECTRIC STRENGTH
- BETTER FIRE RESISTING QUALITIES
- UNAFFECTED BY CORROSIVE ATMOSPHERE
- EASIER AND QUICKER TO INSTALL
- REDUCED COST

Ashathene can be laid directly into cement or plaster without any detrimental effect occurring.
Ashathene is also available in a wide range with single or double wire armouring with an overall p.v.c. sheath. Special sealing glands are available which positively prevent moisture ingress into distribution boxes, etc.
Ashathene is being supplied in large quantities to the National Coal Board, Electricity Boards, etc., and is extensively used in housing estates and industrial projects, including chemical and plating works for which it has special advantages.

NO WONDER ASHATHENE IS BEING USED MORE THAN EVER!

AERIALITE Ltd., CASTLE WORKS, STALYBRIDGE, CHESHIRE

Depots at LONDON, BRISTOL, BIRMINGHAM, MANCHESTER, NEWCASTLE, GLASGOW *This is an advertisement of the Aerialite Ltd. Group of Companies*

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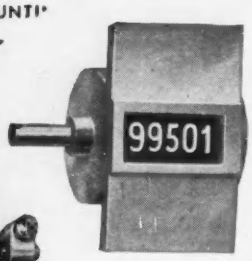

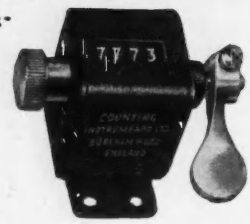

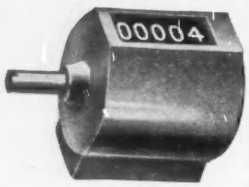

A wide range of small non-reset counters and stroke counters with reset is available. Write for leaflets Nos. 2 and 3. Also mechanical and electromagnetic counters for all purposes.

COUNTING INSTRUMENTS LTD.
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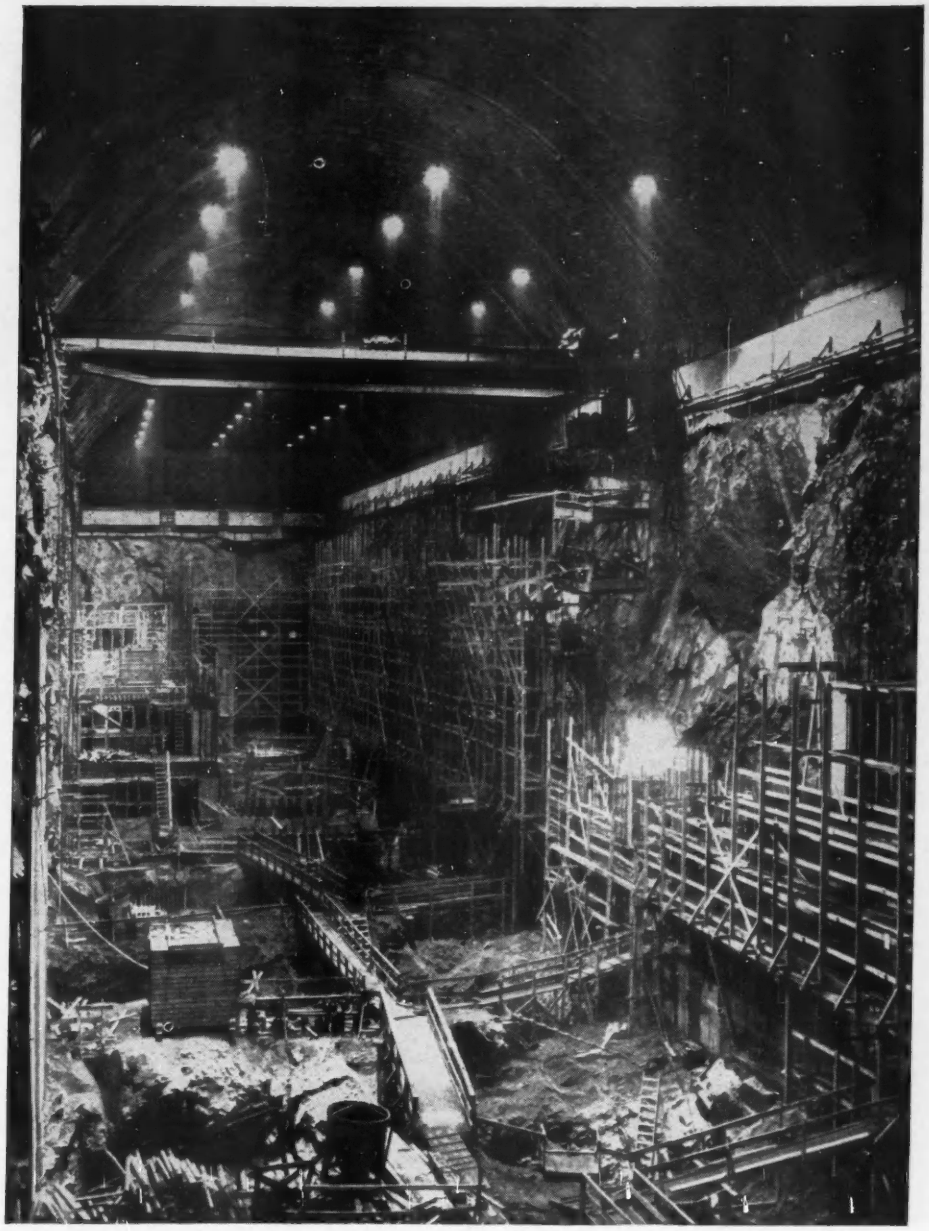
Telephone: ELSTREE 1382-3-4 Cables: COUNTHOR, BOREHAMWOOD

aluminium adventure



powerhouse inside a MOUNTAIN

Excavated inside the heart of Mount Du Bose, British Columbia, this huge man-made cavern will eventually house 16 hydro-electric turbines and generators with a total capacity of over 2,000,000 horse power.

Already, on the other side of the mountain range, a 350 square-mile storage reservoir of rivers and lakes has been formed by reversing an entire river system. The water flows into a 10-mile tunnel drilled through the mountain and plunges 2,585 vertical feet—16 times the height of Niagara—to drive the turbines of the Kemano underground power house.

From Kemano, a 50 mile transmission line carries the power across rocky terrain and over a 5,300 ft. mountain pass to the great new smelter of Aluminum Company of Canada Ltd., at Kitimat—capable when fully developed of producing 500,000 metric tons of Aluminium a year for the markets of the world.

Aluminium Union Limited

(Incorporated in Canada)

THE ADELPHI, JOHN ADAM STREET, LONDON, W.C.2 *An ALUMINIUM LIMITED Company*

PRINCIPAL BRITISH COMMONWEALTH DISTRIBUTOR OF ALUMINIUM

INTRODUCING THE NEW GWB

G.W.B. establish a new conception of long life in heavy duty contactors. 10 amps to 1,400 amps; A.C. or D.C.

Many of the contactors available today have been in production for over 20, or in some cases, 30 years with virtually no change in the design whatsoever. In contrast, G.W.B. Contactors, up to the minute in design, incorporate a host of detailed refinements, all of which contribute to lower power consumption and long-life.

For example the "case history" given below is but one of many examples in which the fitting of G.W.B. Contactors has materially contributed to better performance.

Contactors are fitted to a machine to automatically reverse the 25 h.p. motor when certain conditions arise. It is a heavy, arduous duty and before G.W.B. Contactors were fitted it was necessary to carry out the following maintenance.

Every day the contacts were lanished in position, and on every third day they were taken out of the machine and filed smooth. The average life of the contacts under these conditions averaged three weeks.

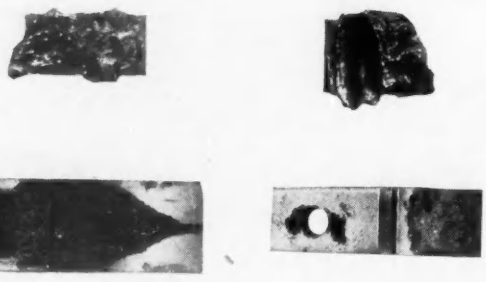
When G.W.B. Contactors were fitted with the machine engaged on identical duties, they were used for *seven weeks* with *no maintenance whatsoever.*

Consequently, in future all contactors used in this factory will be supplied by G.W.B.

Other cases can be cited where the life over comparable contactors is up to ten times longer.

The Special Sintered Tungsten and Silver Contacts

There are many refinements incorporated in the design of G.W.B. Contactors and these have been described in a booklet. One of the most important features is the sintered tungsten and silver contacts. The required metal combination has been made possible by a unique metallurgical technique developed by our Italian associated company, O.M.R. The advantage of this metal combination is that the tungsten is resistant to high temperature conditions, while the silver has excellent conductivity characteristics. When the contact faces are closed, there is a multitude of 'spot' contacts so allowing a short clean break between contacts, instead of the protracted arcing commonly associated with conventional types. The photograph on the right shows a set of copper contacts after one month arduous industrial duty. Below are a pair of G.W.B. contacts, after having fulfilled the same duty, at the end of six months.



PLEASE SEND ME FURTHER LITERATURE ON G.W.B. CONTACTORS. ☐ PLEASE ARRANGE FOR A SALES ENGINEER TO CALL. ☐

Name_____

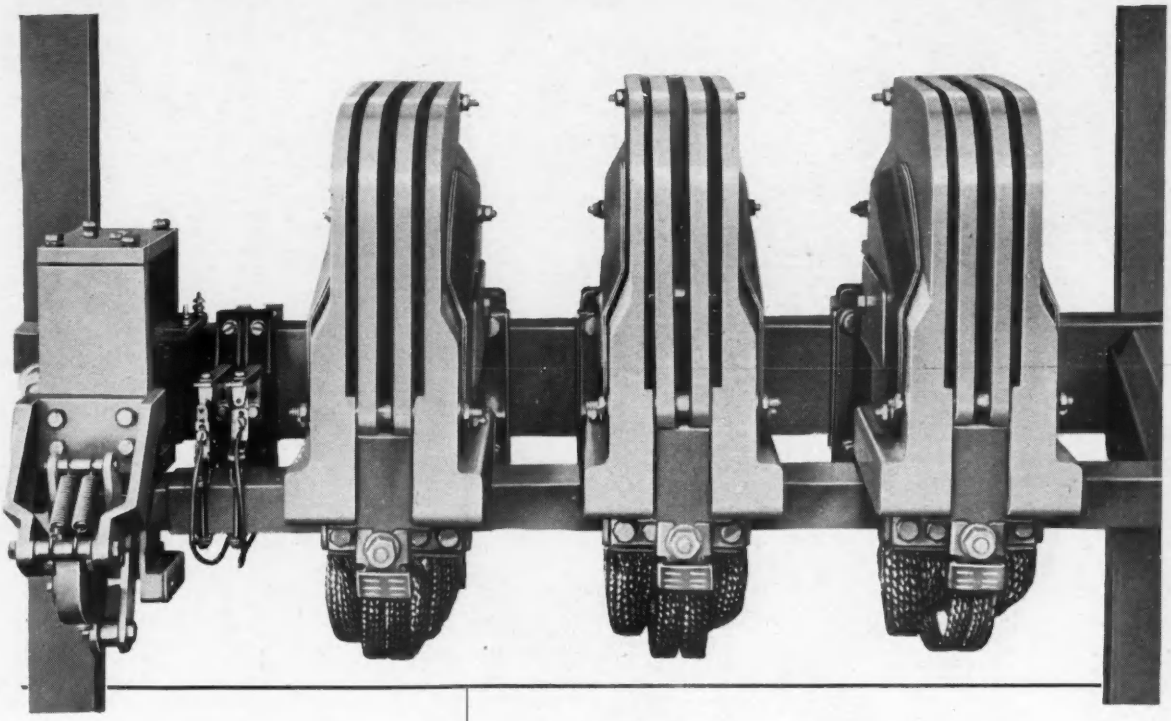
Address_____

_____ E.T.

Write for this free booklet which gives fuller details of G.W.B. Contactor design and full specifications.

Please post this coupon to address on right:—

CONTACTORS



SPECIAL FEATURES OF G.W.B CONTACTORS

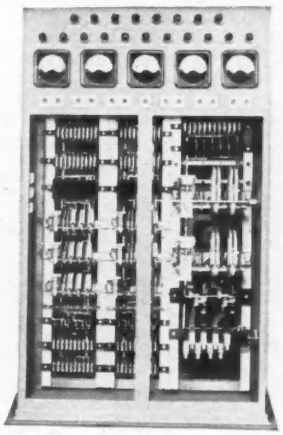
- Contacts of sintered tungsten and silver.
- No soldered parts — end connections are mechanically swaged on to braid.
- Main sections are hot brass stampings.
- Pole bearings have apron shield.
- Arc shields of a special design are moulded in one piece to give rapid arc extinction. Heavy duty types have arc deflectors and splitter.
- Individual adjustable spring pressure between contact faces.
- Spring loaded free floating magnet system on A.C. Contacts.

COMPLETE "TAILOR MADE" CONTROL PANELS

G.W.B. have had considerable experience in the design and manufacture of a wide variety of control panels. An open frame type of assembly is used and contactors are mounted on iron channels, and so can be easily slid along to accommodate additional auxiliary equipment if required.

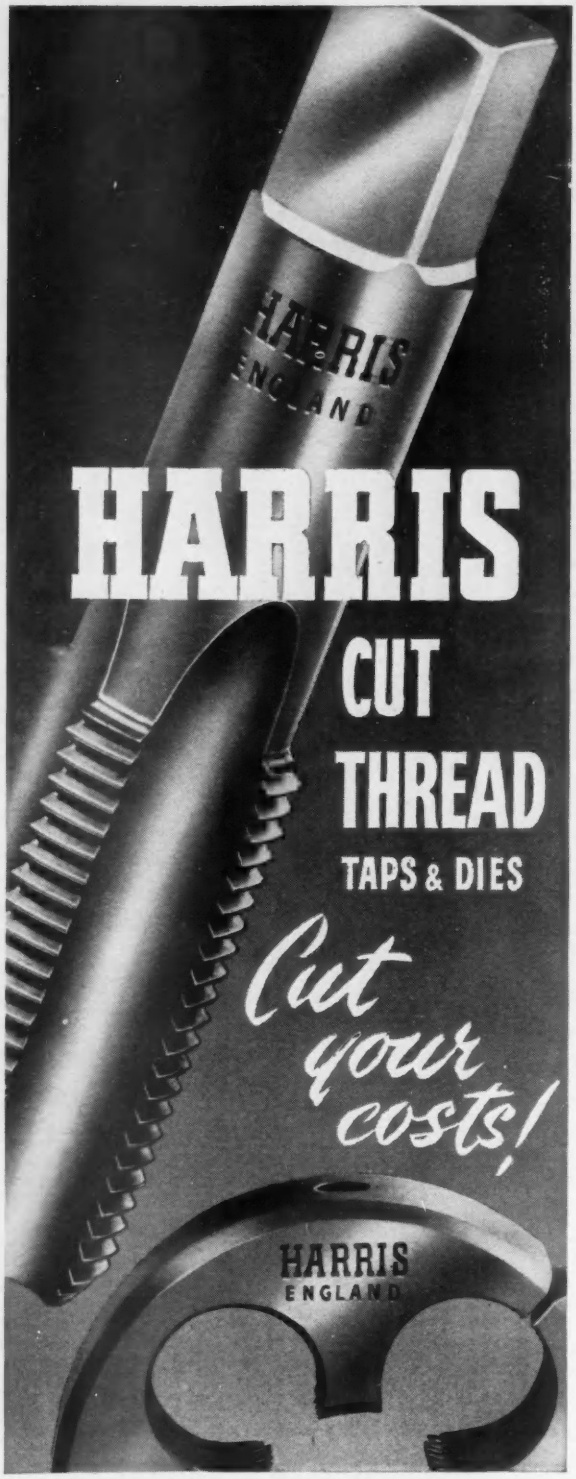
Each contactor has individual insulated mounting.

B.S.S. colour cables are used throughout.



G.W.B FURNACES LTD.
(Control Gear Division)

Dibdale Works, Dudley, Worcestershire
Telephone: DUDLEY 4284. Telegrams: GIBWILDBAR, DUDLEY



JOHN HARRIS TOOLS LTD., WARWICK

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London Sales Office: 5, Victoria Street, S.W.1 **Phone: Abbey 3730**
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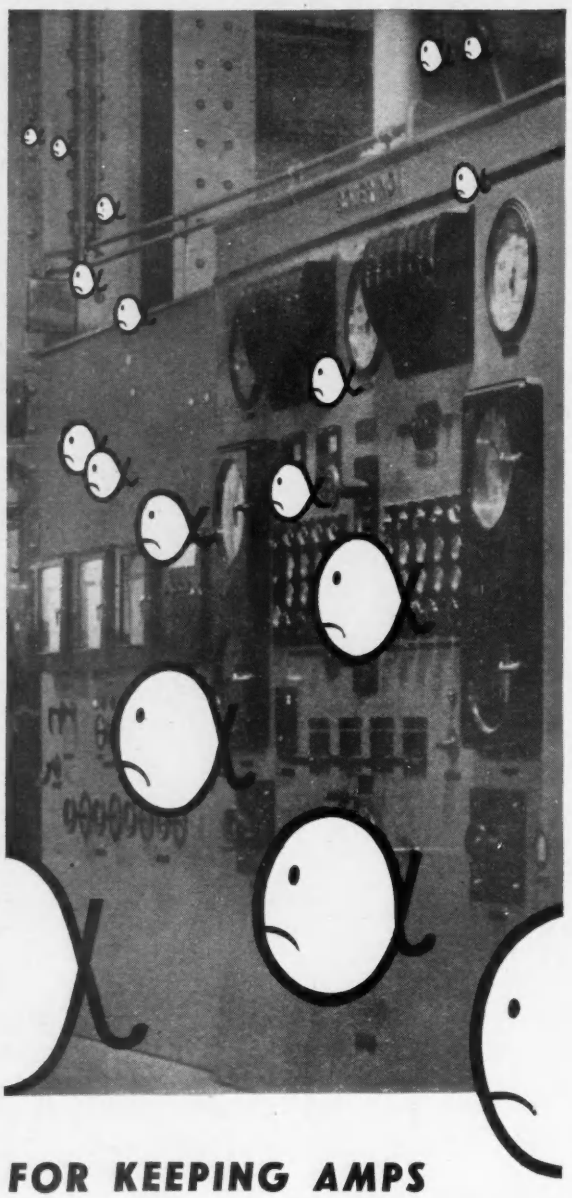


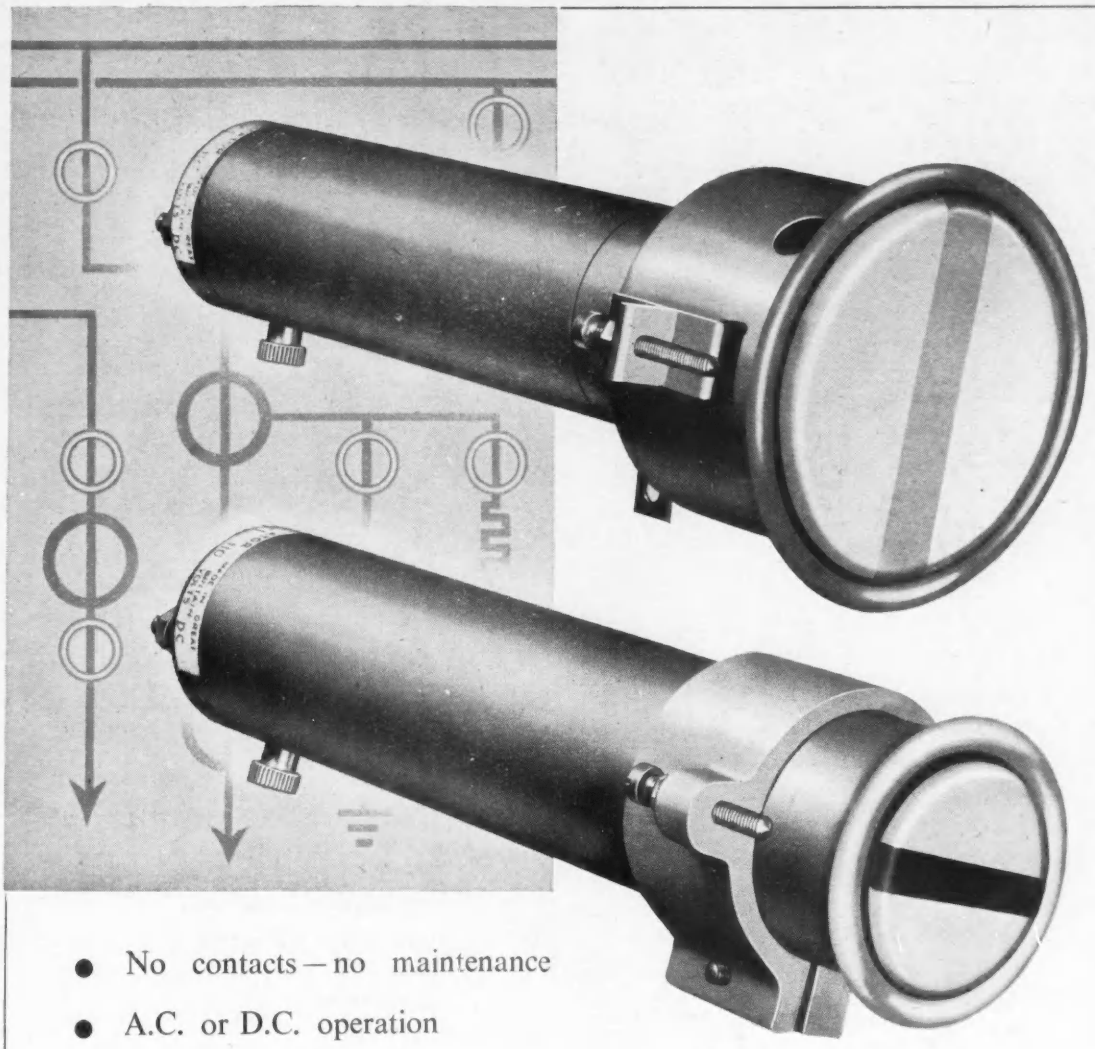
FOR KEEPING AMPS IN THEIR PLACES

There's nothing better than "ASHLAM" insulation board — there's a grade for every job.

ask Ashdowns

ECCLESTON WORKS, ST. HELENS, LANCS. Telephone: St. Helens 3206
Ashdowns Limited is a subsidiary of Pilkington Brothers Limited
"ASHLAM" is the registered trade mark of ASHDOWNS LIMITED.

Automatic semaphore indicator type VAM



- No contacts—no maintenance
- A.C. or D.C. operation

'ENGLISH ELECTRIC'

protective and auxiliary relays

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Relay Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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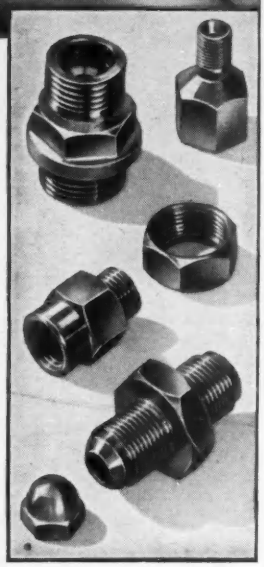
For highest speed with absolute precision—specify



No. 4 Turning and Screwing Brass Rods

Ever higher speeds demand ever greater precision—and British industry needs both if production is to be increased and costs reduced. McKechnie Brothers have developed a range of standard high-speed turning and screwing rods, including the popular **No. 4** and **YS,** all of which are guaranteed to combine the correct alloy and temper for maximum machine speeds and longest tool life. For full details of these and other MKB free machining rods please write to—

McKECHNIE
BROTHERS LIMITED

14, BERKELEY ST., LONDON, W.1. Phone: HYDe Park 9841/7

Metal Works: Rotton Park Street, Birmingham, 16.
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Advice about fire

It costs you nothing to consult Pyrene Fire Engineers about Fire protection at your plant—yet it may result in the saving of thousands of pounds worth of equipment.

The wide experience of The Pyrene Company in developing CO_2, Dry Chemical, Special Liquids including Chlorobromomethane, Foam and all forms of fire fighting appliances and installations to meet the special needs of Electrical Industries is at your disposal.

If you wish to receive illustrated literature, or would like our technical representative to call, without obligation, write now to Dept. E.T.10.

THE PYRENE COMPANY LIMITED,
9 GROSVENOR GARDENS, LONDON, S.W.1

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FIRE FIGHTING EQUIPMENT

AN INVESTMENT IN PEACE OF MIND

INCREASED LIGHT OUTPUT

from

Elasta

Colour	Size	Average light output during first 5,000 hours of life (lumens)	
		OLD	**NEW**
Deluxe Warm White	5 ft 80w	2,240	**2,560**
	4 ft 40w	1,200	**1,360**
Natural	5 ft 80w	2,720	**3,120**
	4 ft 40w	1,520	**1,640**
	3 ft 30w	1,020	**1,170**
	2 ft 40w	920	**1,080**
	2 ft 20w	580	**640**
	1½ ft 15w	390	**420**
	8 ft 125w	5,000	**5,375**

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Fluorescent Tubes

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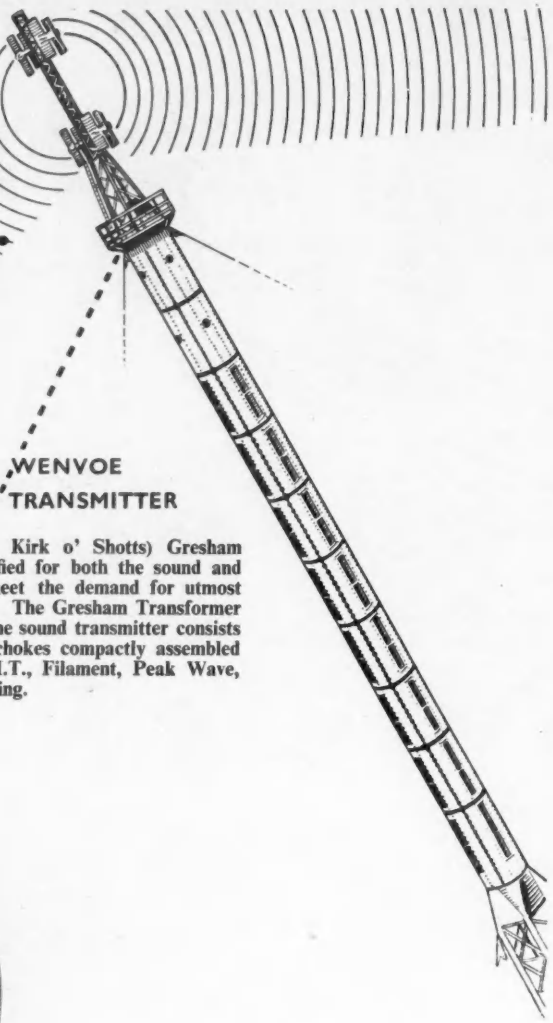

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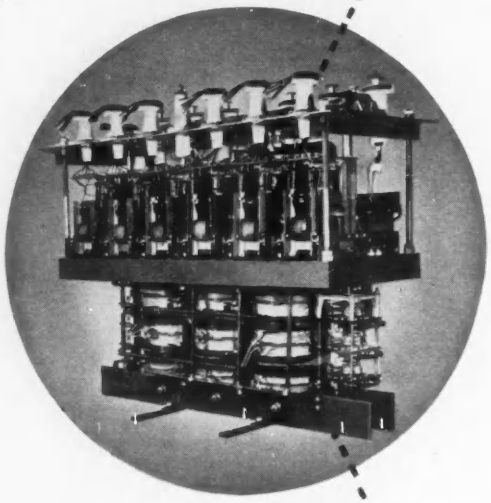
At Wenvoe (as also at Kirk o' Shotts) Gresham Transformers were specified for both the sound and vision transmitters to meet the demand for utmost reliability and efficiency. The Gresham Transformer unit supplying power to the sound transmitter consists of 25 transformers and chokes compactly assembled in one tank to give E.H.T., Filament, Peak Wave, Grid Control and Smoothing.



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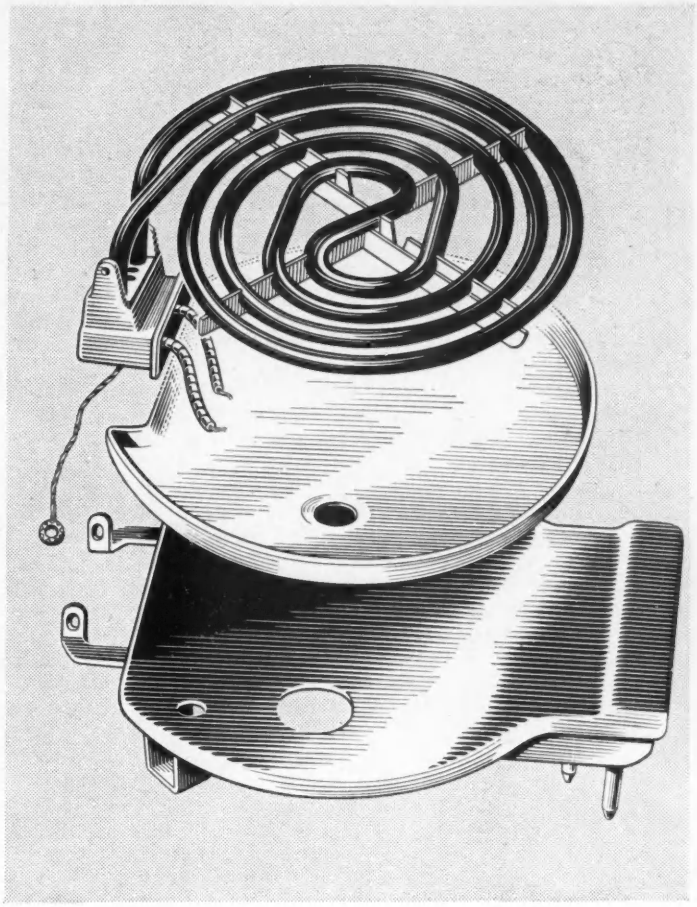

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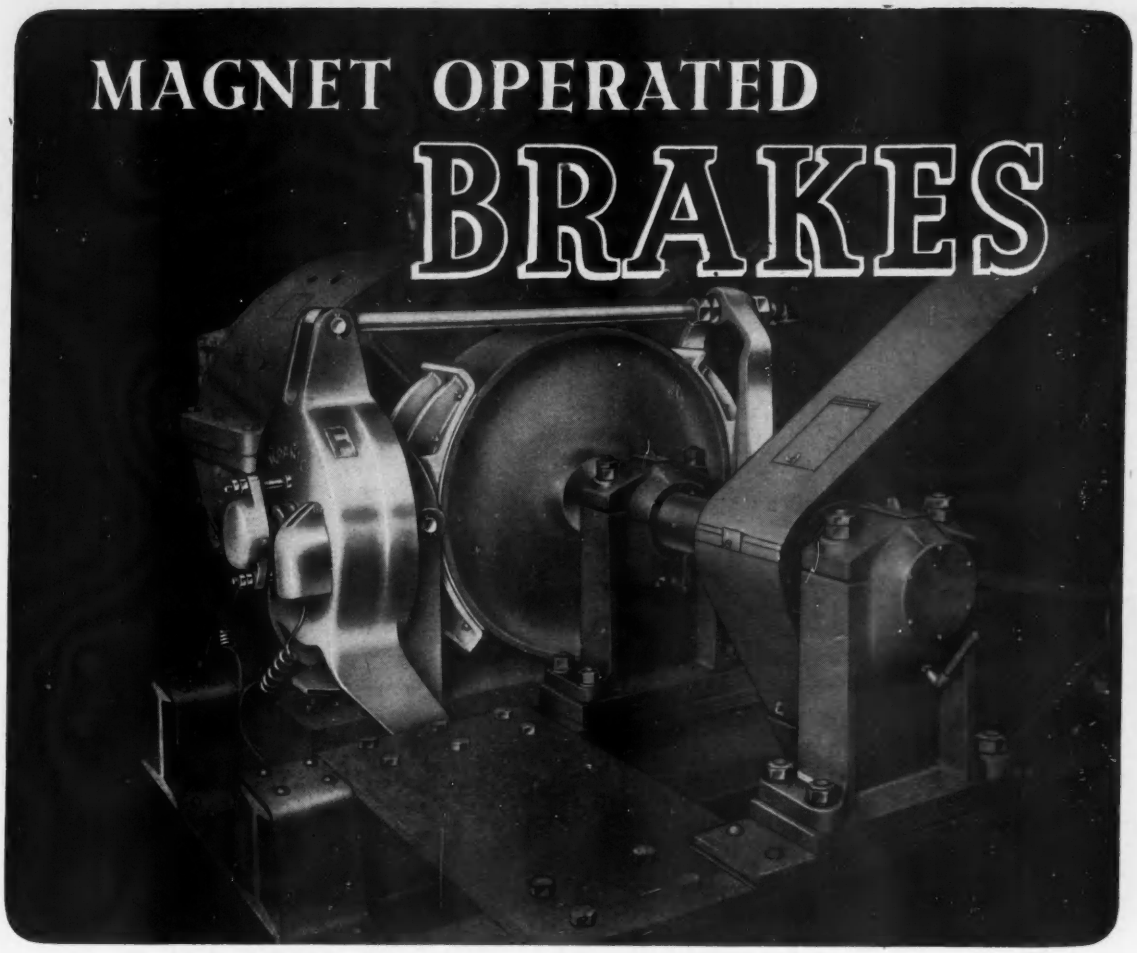

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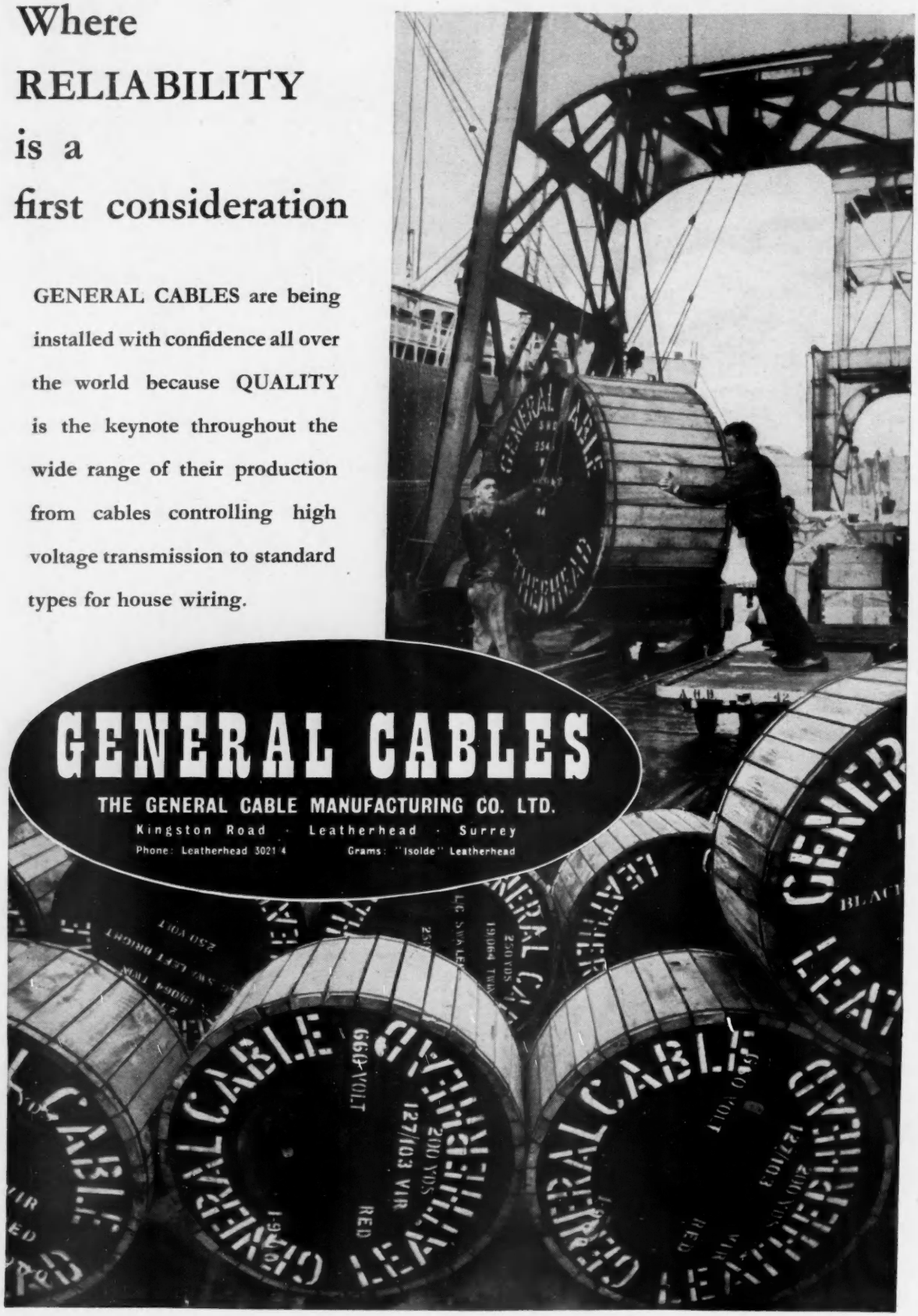
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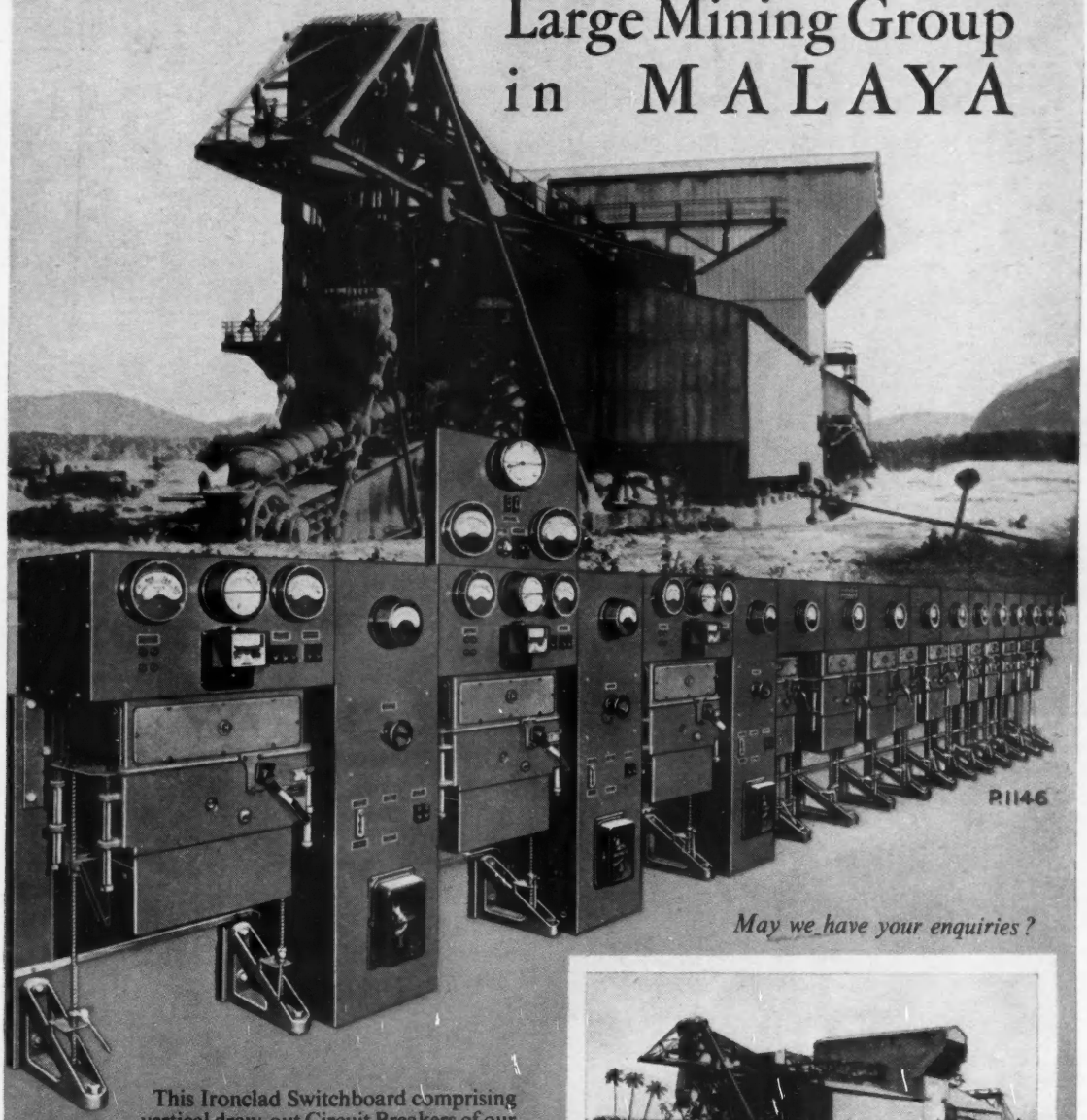
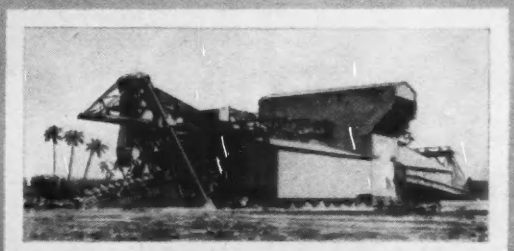
"Erskine Heap" *installation* for a Large Mining Group in MALAYA

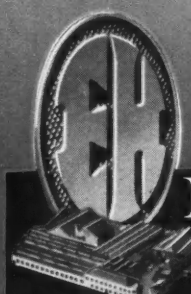


May we have your enquiries?



This Ironclad Switchboard comprising vertical draw-out Circuit Breakers of our OS. 22 pattern for controlling the power supply to various units of a Tin Dredge, has been supplied recently through the Engineering Department of our SOLE AGENTS FOR MALAYA, MESSRS. PATERSON, SIMONS & CO. LTD., to a large Mining Group for one of their Dredges.

L.T. SWITCHGEAR 50/5000 Amperes
E.H.T. SWITCHGEAR up to 11 kV 250 MVA rupturing capacity
MOTOR CONTROL GEAR ½/5000 H.P.



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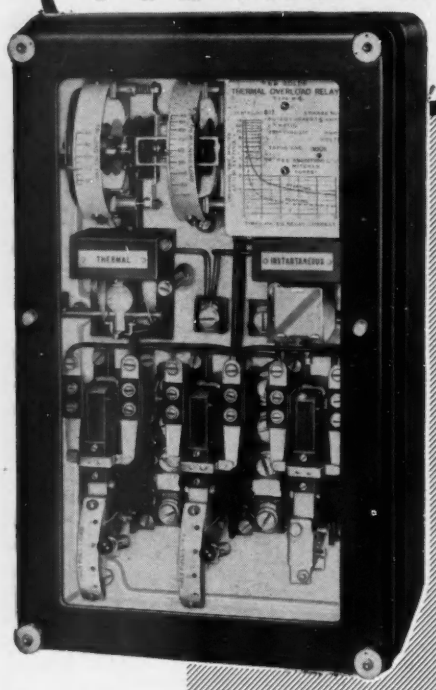
YOUR MOTORS
with
P & B Golds' Relays



For motors with any starting periods or starting currents under extremes of ambient temperature.

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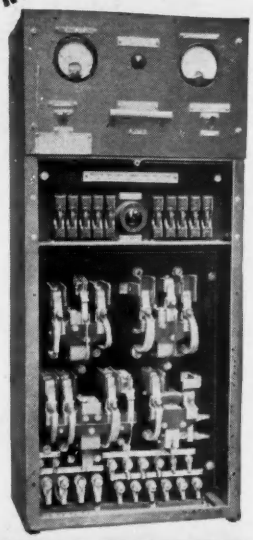

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THE
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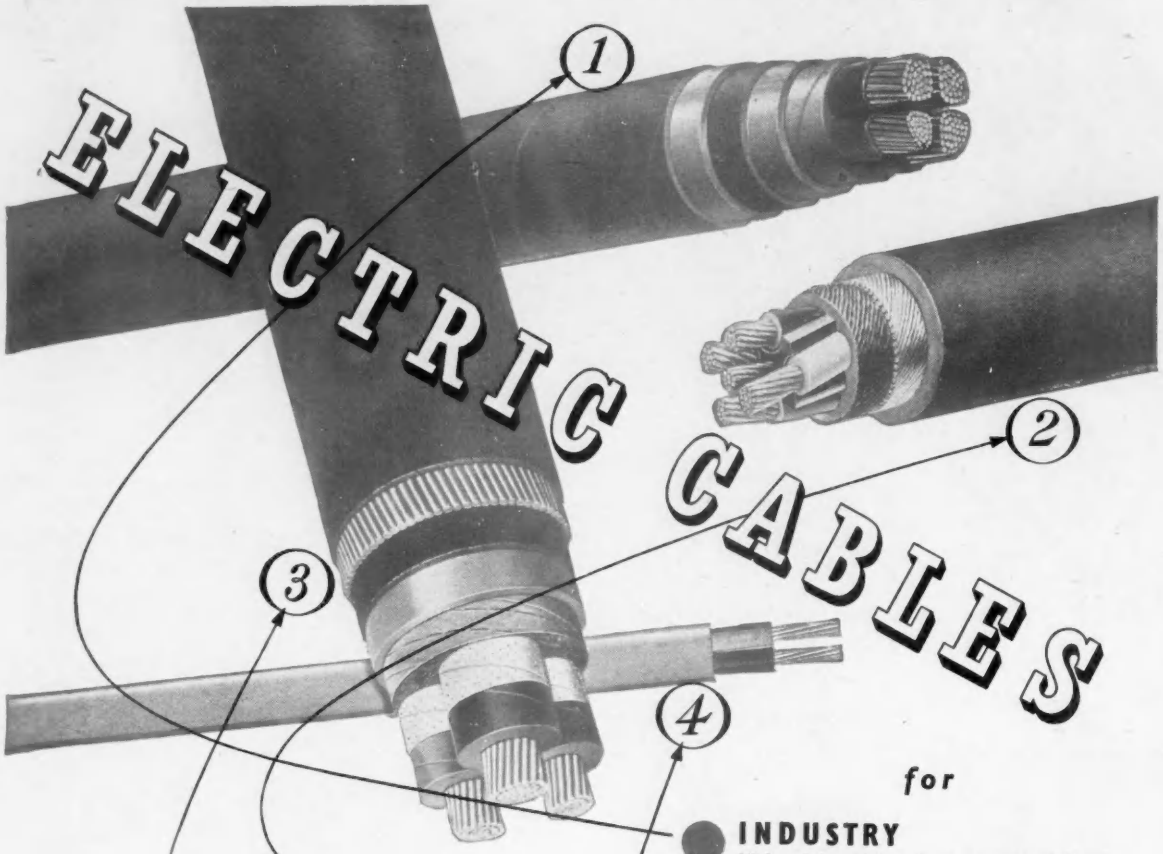

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new editions of
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VERSCO SQUARE DE LUXE BOILER. This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

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available from
100 amps. — 2000 amps.
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2, 3 and 4 bar
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together with complete
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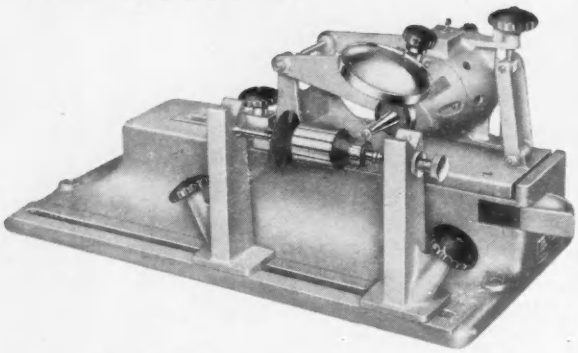

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distinctive, durable, in various colours

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E36

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says Mr. Tape the Tailor

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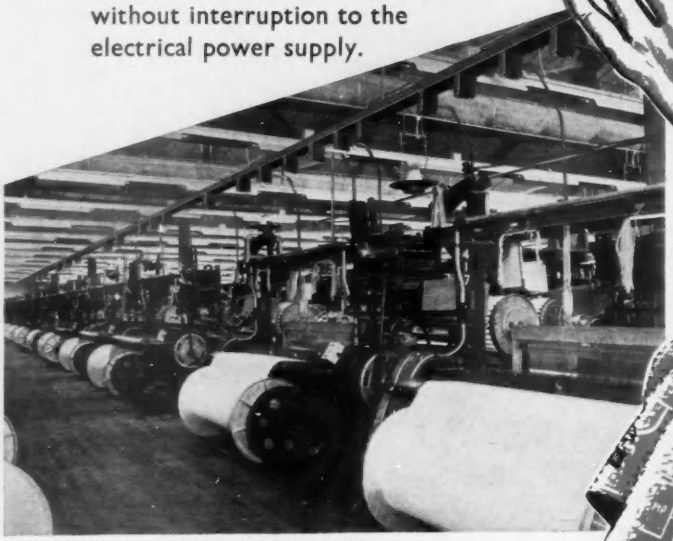

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BUSBAR TRUNKING

the modern system of electric power distribution

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Storage Problem Solved—at Kearsley

MH 13

...with Beaumont Drag Scrapers

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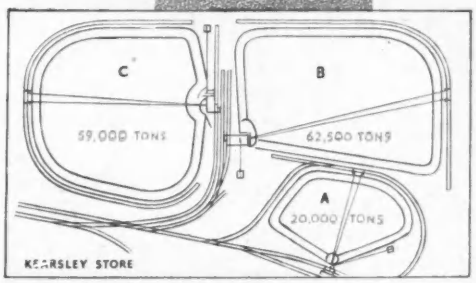
Further extensions at Kearsley call for a still greater stocking area, and Beaumont Drag Scraper equipment has again been specified.

Write now for further details of Beaumont equipment



Beaumont Drag Scrapers are suitable for any shape or size of storage area. Maintenance and running costs are low. The simplicity of the system permits unskilled labour to be used.

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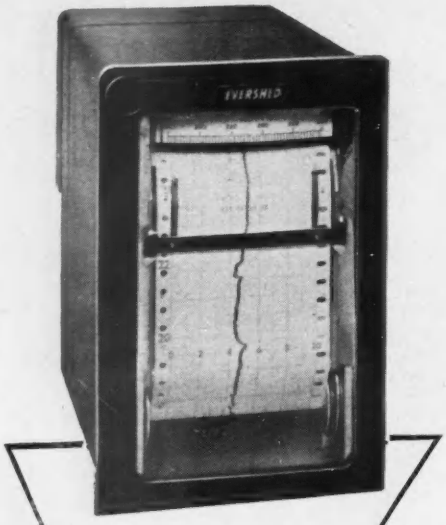

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The modern trend towards miniaturisation in industrial control equipment has led to the design and development of the Evershed Miniature Recorder. Illustrated below is a Control Desk recently supplied to the Grangemouth Refinery of Scottish Oils Ltd., on which 38 recorders are fitted. They have also been supplied for the new Anglo-Iranian Refinery at Aden.

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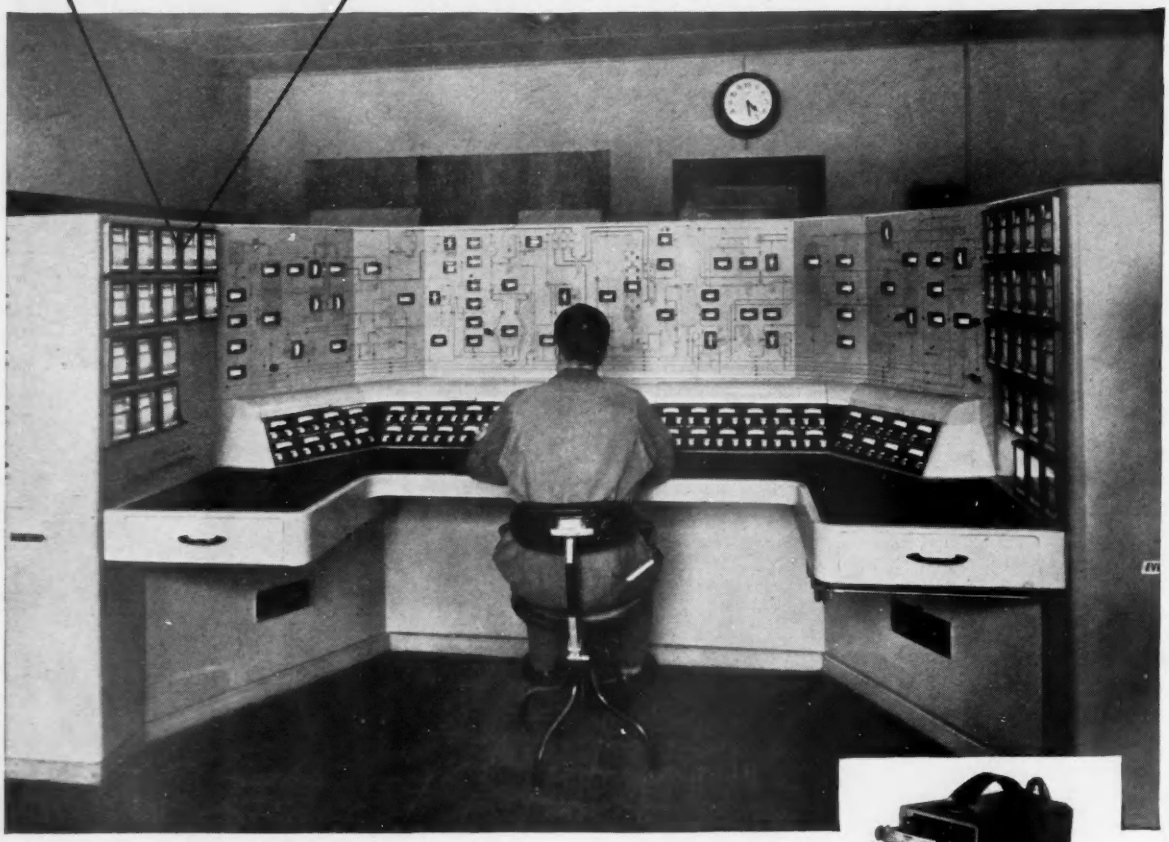
FOR FULL DETAILS, WRITE FOR PUBLICATION J. 282



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6/154

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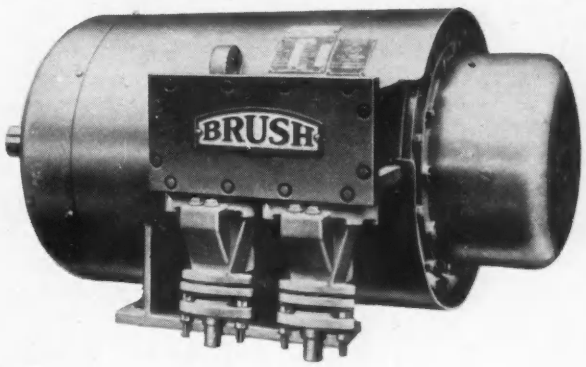

FLP

Full particulars and prices are available on request. Our technical engineers are at your service without obligation.

The best answer is—

Flameproof motors by BRUSH

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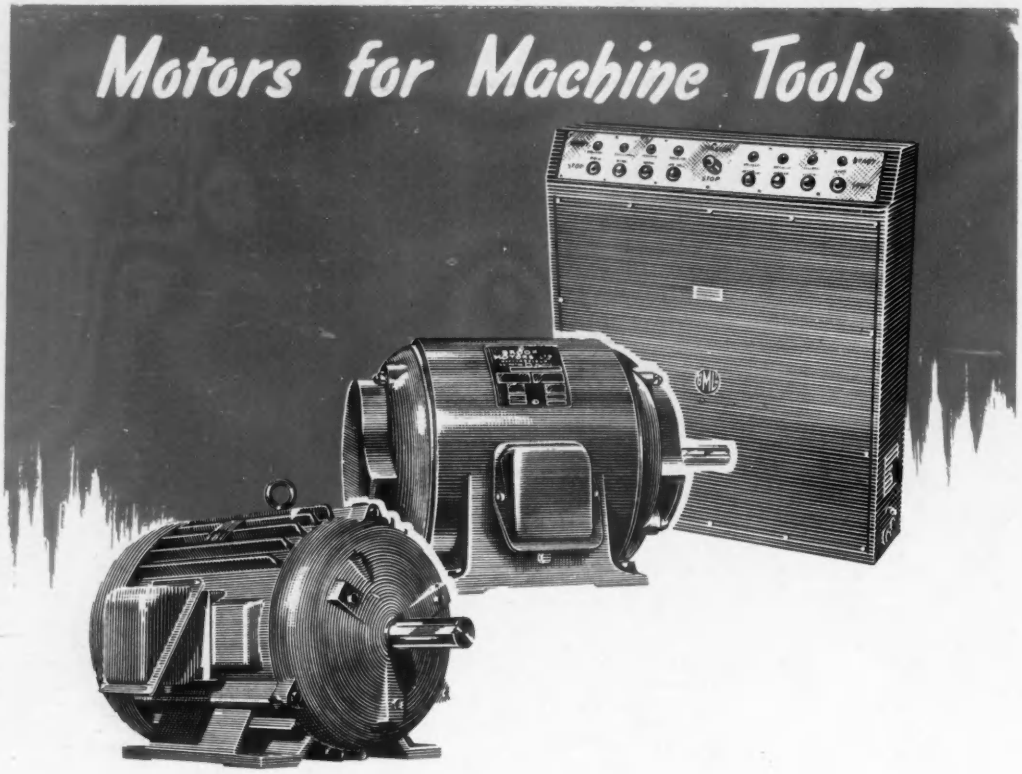
B.36

Motors for Machine Tools



BROOK offer a Totally Enclosed Fan Cooled motor to B.S. 2083 : 1954 plus a Drip Proof range to the same outputs and fixing dimensions.
Further details of this exclusive BROOK offer in List No. 789A.

SPECIAL CONTROL PANELS

In addition to their standard range of control gear BROOK make special starter cabinets to customers' requirements. A useful feature for machines incorporating several motors. List No. 757/A explains this service.

Write now for copies of the above Lists, which will be sent without obligation.

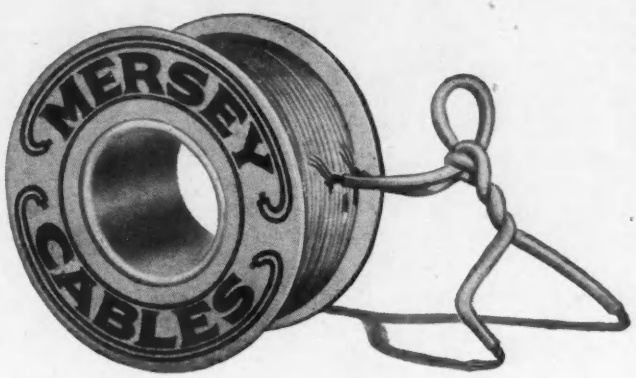
BROOK MOTORS Ltd

BROOK MOTORS LIMITED

HUDDERSFIELD • ENGLAND

MAKERS OF A.C. ELECTRIC MOTORS FROM ⅛TH. TO 350 H.P.

I.TP 318



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RUBBER AND THERMOPLASTIC INSULATED WIRES, CABLES AND FLEXIBLES

MERSEY CABLE WORKS LIMITED

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MINERVA

ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES (NATURAL RESIN TYPE)

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THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

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CORE-PLATE VARNISHES (STOVING AND AIR-DRYING)

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COMPOUNDS (VARIOUS TYPES)

All the materials listed conform to B.S. Specifications wherever applicable.

Our Insulating Varnish Department includes research and testing laboratories; the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

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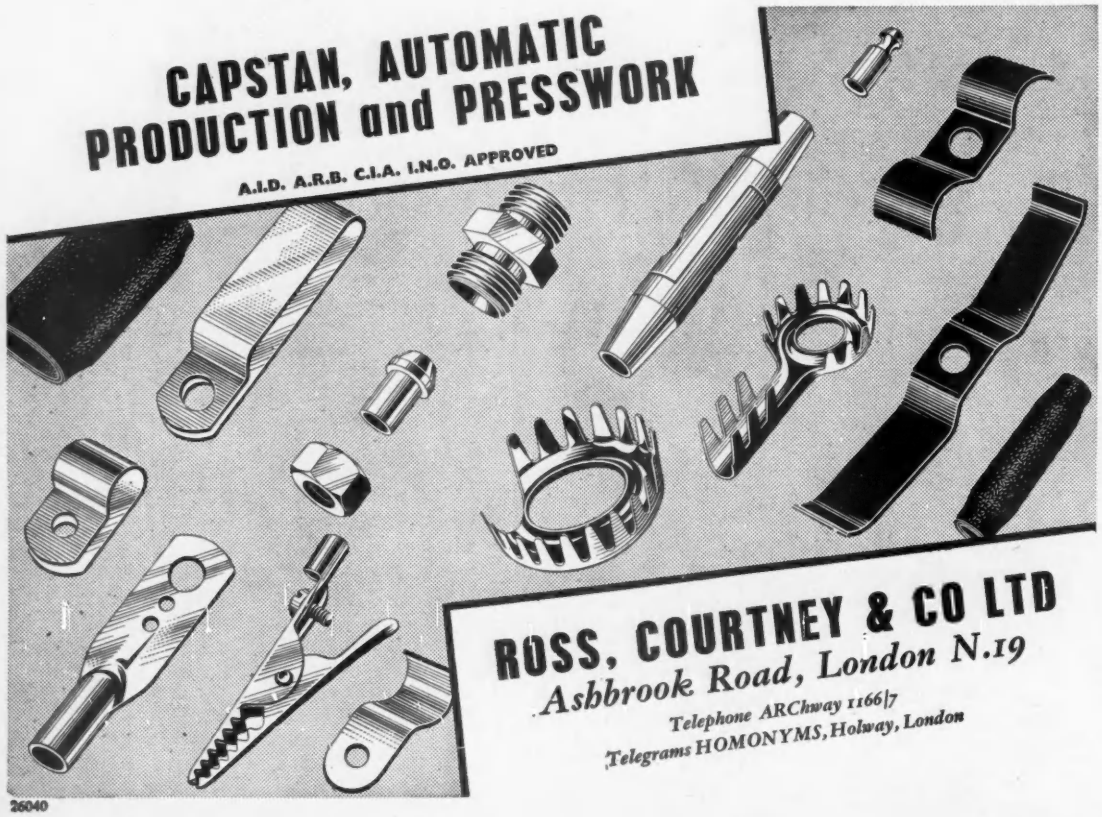

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Supplied to County Councils, Post Offices, Public Works Departments, Electricity Boards and leading industrial concerns.

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Stoutly designed shades with separate ventilated gallery. Allows ample ventilation and provides maximum illumination without glare.

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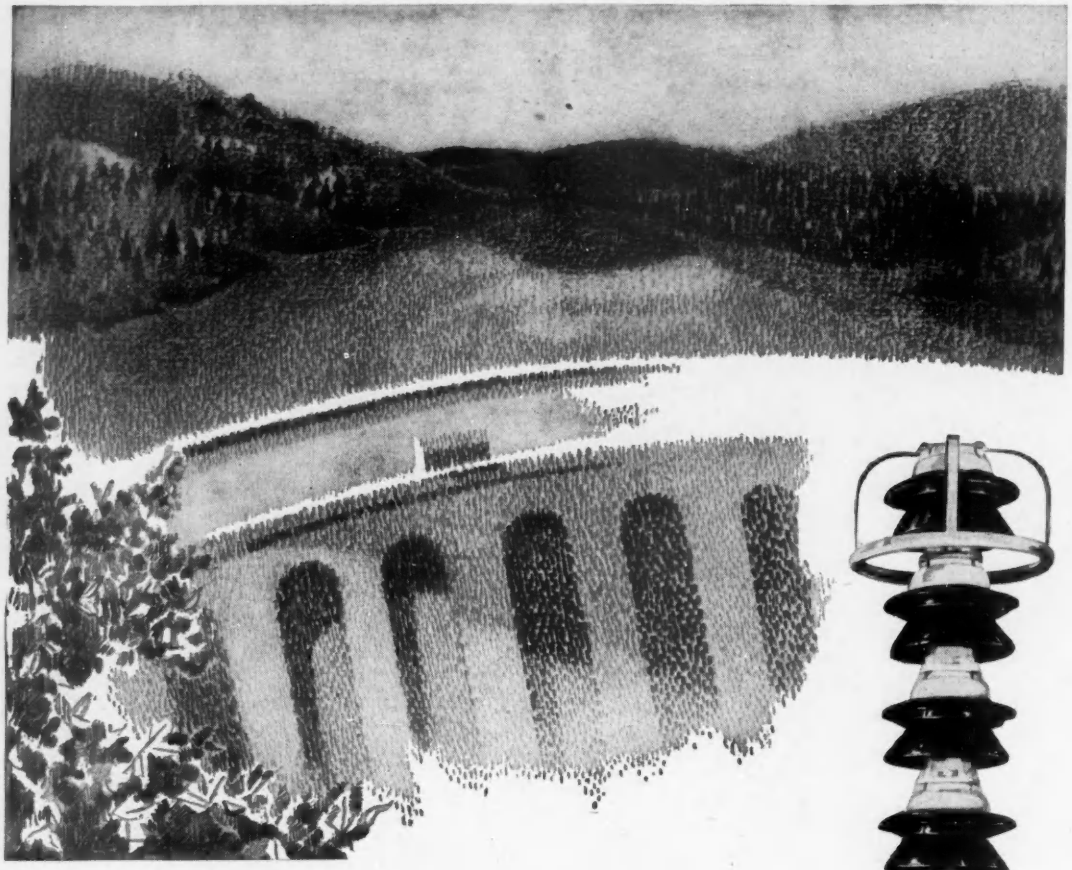

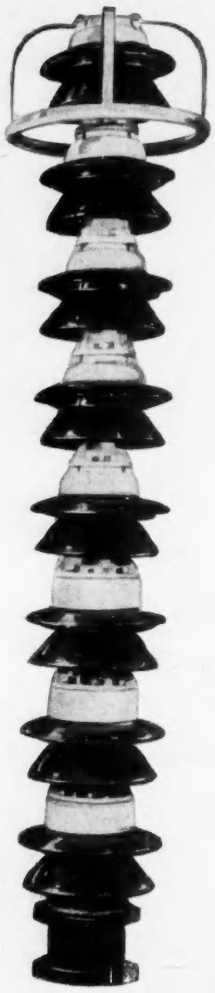

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for the excellence of

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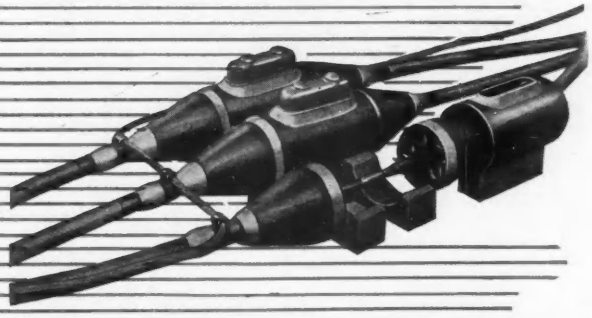
No migration of cable compound under any conditions of laying.

Impregnated with compounds which are ***SOLID*** *up to 65° C.*

No excessive pressure or vacuum in service



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No compound migration from joints.

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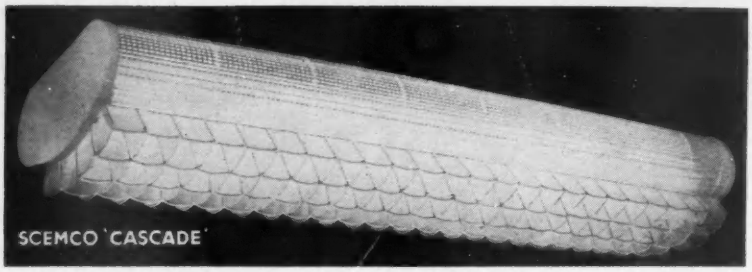

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. . . as with food so with
Fluorescent fittings, finesse always
attracts the better type of business

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SCEMCO "CASCADE"

(All Plastic Diffuser) FITTING

TWIN LAMP 5 ft. 80 watt £15·15·0 list
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The SCEMCO selection enables you to meet every type of demand

FITTINGS TO SUIT ALL REQUIREMENTS from:—

. . . when it comes to bread and cheese
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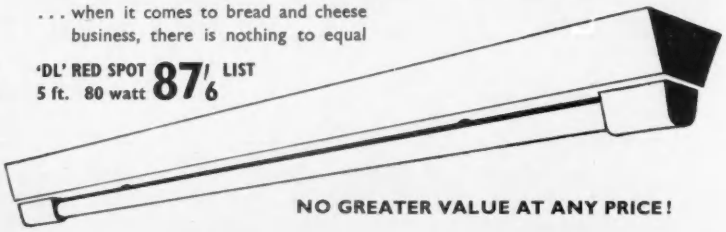

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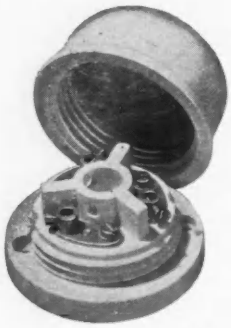
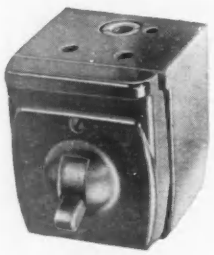


Porcelain Ceiling Rose



Top Entry
Porcelain Switched
Socket

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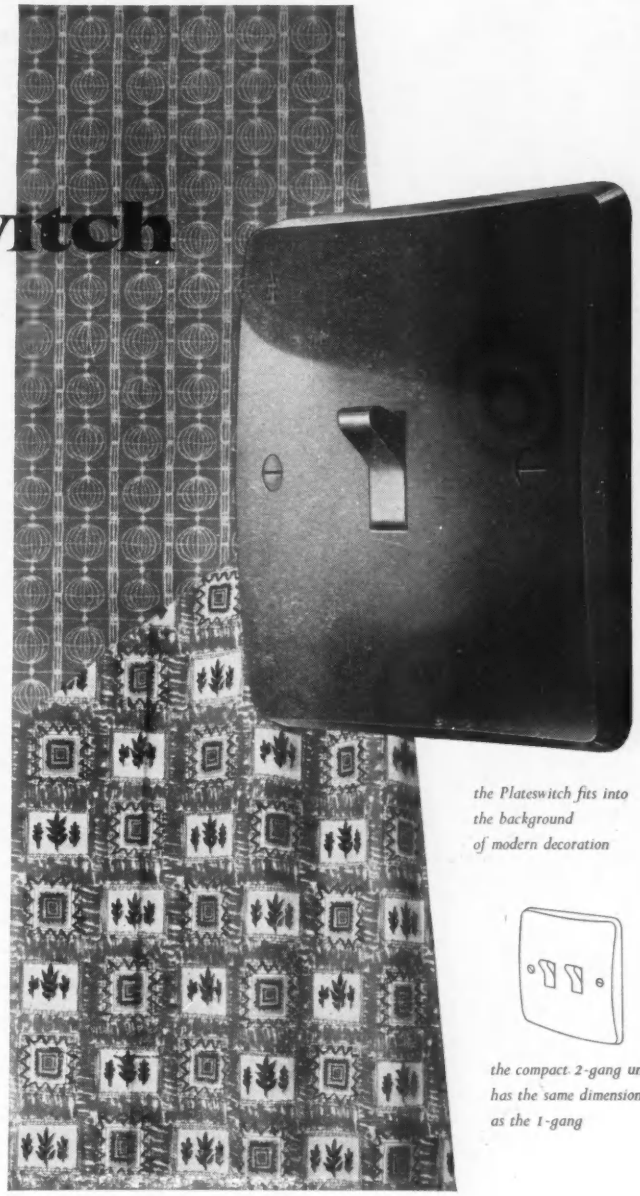
MK97DHB

A distinctive new design combining all the features you have asked for

the **Plateswitch**



the Plateswitch fits into the background of modern decoration

the compact 2-gang unit has the same dimensions as the 1-gang

INSTALLATION is simpler . . . speedier. Both one and two gang switches have 2⅜" fixing centres. The fixed plate ensures automatic levelling with the plaster. A range of boxes gives a choice of cable and conduit entries.

THE ACTION is positive, yet can be controlled in silence. Contacts are balanced for maximum pressure with minimum stress, giving trouble-free performance and long life. The movement is factory-sealed and requires no maintenance.

THE COST is remarkably low — right in line for the most competitive housing work. For example, the ivory **Plateswitch** costs less than you usually pay for brown.

THESE FEATURES SIMPLIFY STOCKING

Every **Plateswitch** is supplied with four screws to match — two 4BA for metal boxes and two No. 5 wood screws for wood boxes.

The two gang **Plateswitch** has two 2-way switches only, each or both of which can be wired as 1-way.

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MK ... the mark of leadership

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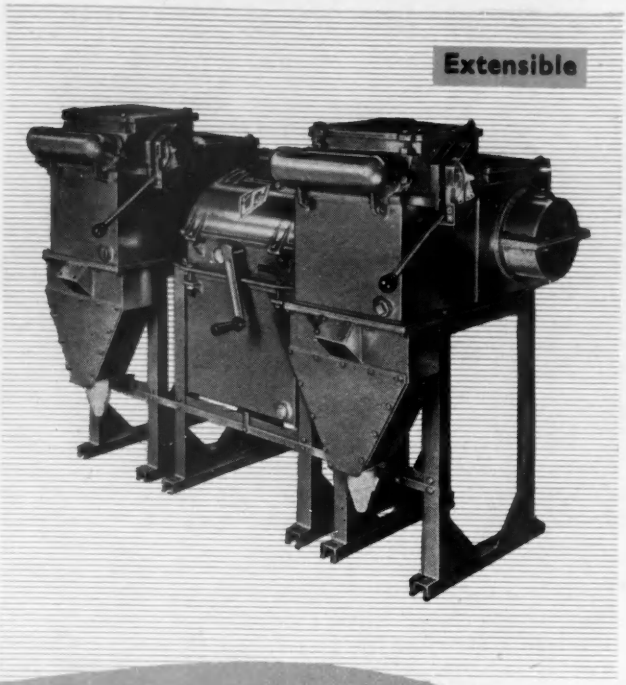

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Rupturing capacity 250 MVA ASTA. Tested at both 6.6. and 11 kV with fault making load breaking Isolators.

Impulse tested

Rust proof finish if required for outdoor installation.

Many different arrangements available including transformer mounting and for incorporation in switchboards with Oil Circuit Breaker Units.

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The following can be fitted if required:

Spare fuse container. Ammeter. Potential indicator. Shunt trip. Earth Leakage trip. Earthing and/or testing device for Fuse Switch. Metering Unit with Voltage and current transformers.

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A fine example of machine shop lighting by Revo "Trufolite" fluorescent fittings, suspended in continuous lines.

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FOR close on half a century the Revo Electric Co. Ltd., has specialised in the design and production of lighting fittings to meet the varying needs of industry; with the result that, to-day, the range includes units suitable for the efficient illumination of factories - Offices - Mines - Chemical plants - Railways - Ships - Sports grounds - Marshalling Yards etc.

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Revo aluminium die-cast bulkhead fitting.

Revo medium beam flood-light fitting.

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LIGHTING FITTINGS

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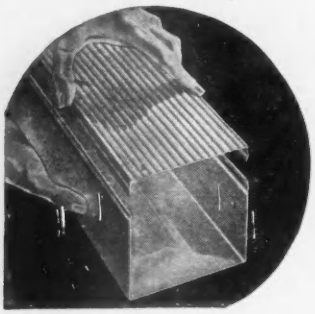

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Sizes stocked: 4 × 4, 4 × 3, 3 × 3, 3 × 2, 2 × 2, 2 × 1, 1 × 1, *and* 1 × ½.

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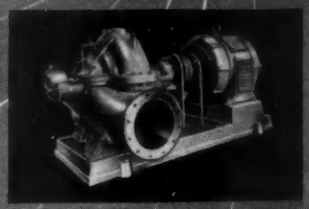
WORTHINGTON-SIMPSON

A name known for over a century throughout the world for active participation in the development of modern pumping machinery—every modern facility for testing and manufacturing—world-wide organization for service. These comprise the intangibles, beyond evaluation, represented by the nameplate bearing the name of Worthington-Simpson.



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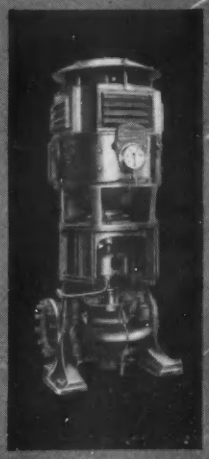
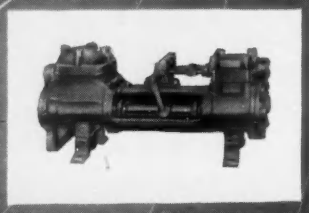
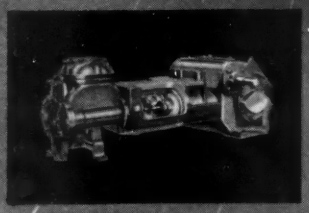


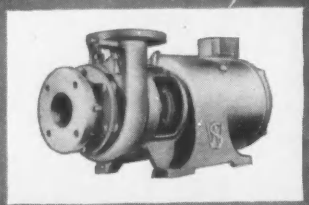
NUMARINE



STEAM



POWER



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When it's a question of pumps the engineer goes to

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1 kW 2 kW
Cat. Nos. 95708/9
available Nov. 1954
1 kW 50/- + 18/4 P.T.
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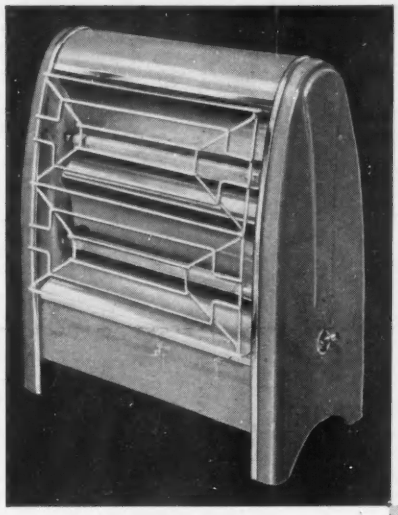

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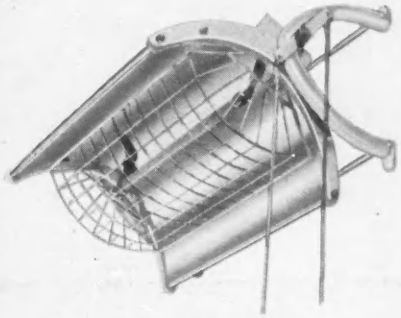
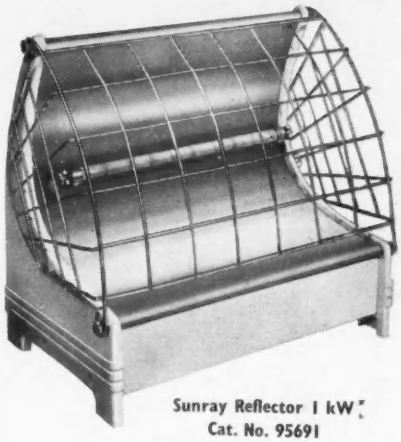
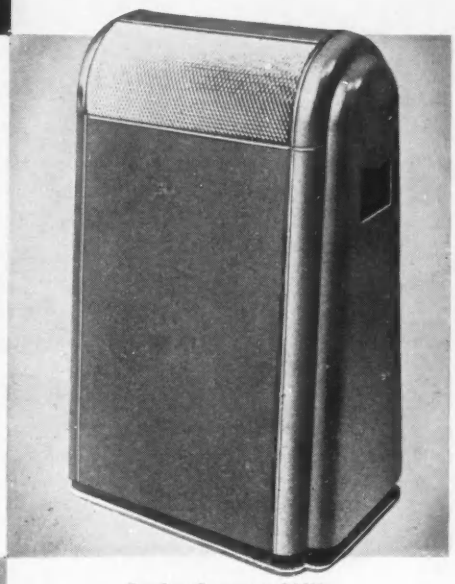
The clean lines and attractive finish of this new range reflect the inherent quality which distinguishes all Falks products. Priced to meet today's conditions, they will find ready acceptance among your customers.



Bathroom Fire 1 kW
Cat. No. 95670
63/- + 23/1 P.T.



Sunray Reflector 1 kW
Cat. No. 95691
68/3 + 24/11 P.T.



Peerless Convector 2 kW
Cat. No. 95699 available Nov. 1954
210/- + 77/- P.T.

Bowl Fire 600 watts
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1 kW 52/- + 19/1 P.T.
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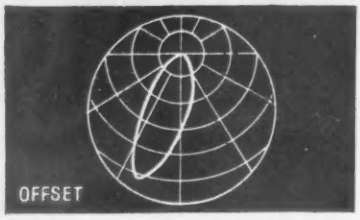
ARCHITECTURAL SCHEMES

A New Lighting Approach



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A new lighting approach to Architectural schemes has been made possible by the development of a range of Holophane 'LENTILITE' Circular In-Bilt units which give Intensive, Concentrating and Offset light distributions.

The range includes Flush and Semi-recessed units for recessment into the ceiling, and Close-Ceiling units for use where recessment is not possible.

'Lentilite' units give the Architect wide scope for integral design while affording a high standard of light control combined with pleasing appearance. Full details and technical information available on request.

HOLOPHANE LIMITED

SCIENTIFIC ILLUMINATING ENGINEERS

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Architects :
Messrs. Howard, Souster & Fairbairn.
81, Piccadilly,
London, W.1.

Electrical Contractors :
Berkeley Electrical Engineering Co. Ltd.,
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This impressive office block situated in Mark Lane close by the Tower of London, covers a site area of nearly 40,000 square feet.

Owned by the City of London Real Property Company Limited, it is a fine example of post-war development, and, like many other modern buildings, it is wired throughout with

HENLEY CABLES

Let Henley Cables carry the current

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DAMP? HEAT?
COLD? FUMES?
VIBRATION & SHOCK?

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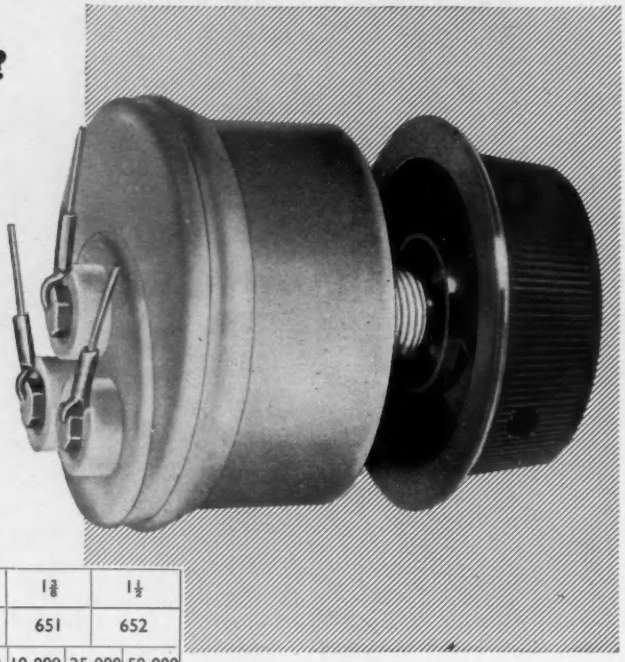
Hermetically sealed potentiometers are Type Approved to Class H.1. of RCL 121, 2.5 watt rating for use in Arctic and Tropical conditions.



Shaft Length (inches) ...				$\frac{7}{8}$		1		$1\frac{1}{8}$	$1\frac{1}{4}$		$1\frac{3}{8}$		$1\frac{1}{2}$	
Part No.				647		648		649	650		651		652	
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Current (amps.)	1	.7	.45	.32	.22	.14	.1	.07	.045	.032	.022	.014	.01	

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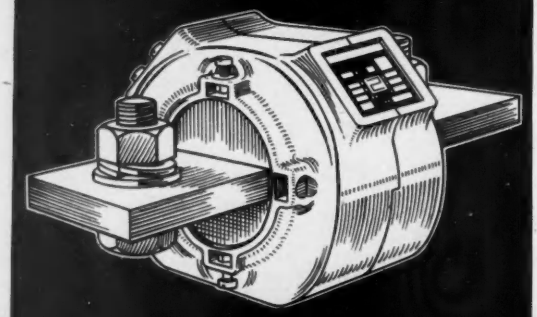
Metering Current Transformer Type R 712
5VA and 15VA. Classes BM, CM, A, B & C



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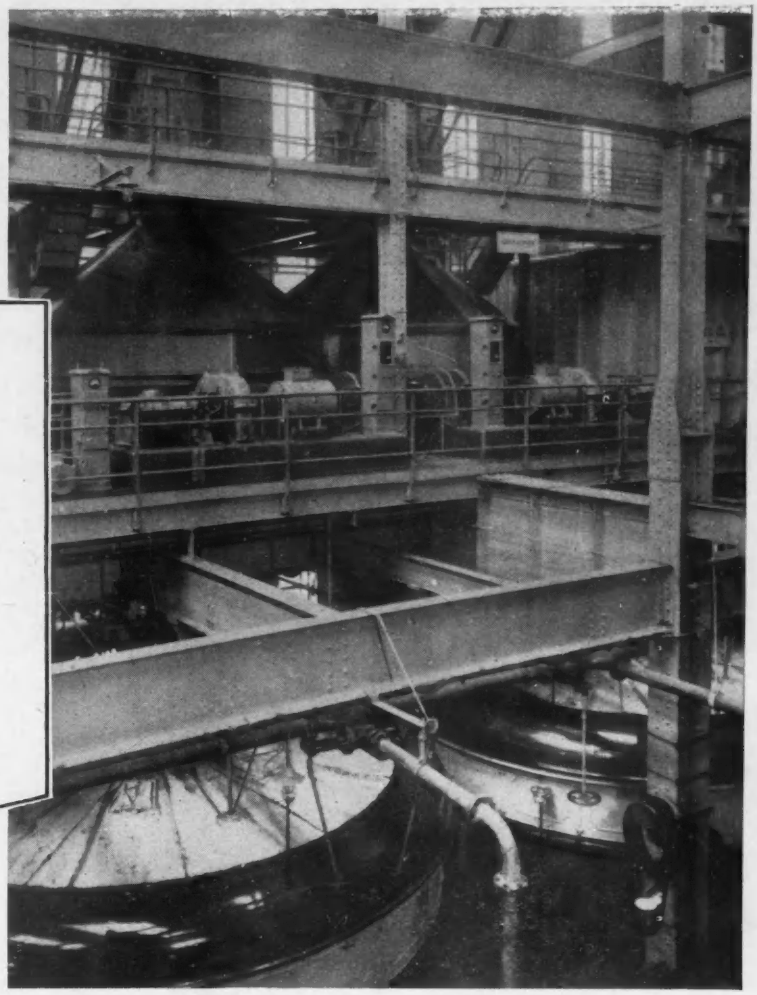
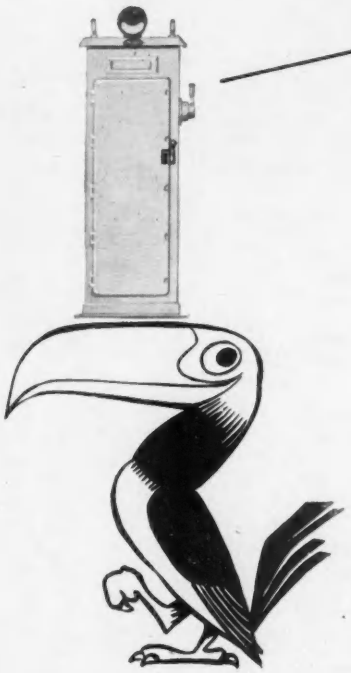


Installed at Guinness's Park Royal Brewery



Brookhirst Control Gear was supplied to Arthur Guinness Son & Co. Ltd., for controlling the processing plant in their Park Royal Brewery. In the illustration are shown three motor starting panels for drives situated in the Brew House.

As specialists with over fifty years' experience, Brookhirst are almost invariably associated with notable installations. They are called upon to solve motor control problems in activities as divers as the manufacture of household goods and the production of atomic energy. With a world-wide reputation for quality, reliability and service, Brookhirst control gear is the inevitable choice of all who specify the best as a matter of long-term economy.

The services of Brookhirst Specialist Engineers are available to all concerned with the ordering, supplying, and installing of control gear.

BROOKHIRST

MOTOR CONTROL GEAR

BROOKHIRST SWITCHGEAR LIMITED CHESTER

NEW ELECO "PERSPEX" FITTING FOR INDUSTRIAL CONDUIT LIGHTING

—Increases Light Output Ratio 10-15%

This new Eleco fitting (patent applied for) is efficient, versatile and economical. It can be used either open, or made completely dustproof with a diffusor cover. The reflectors are made in two grades of opal 'Perspex', whilst the covers are obtainable in three grades, including a pinspot pattern "Perspex". This means that a suitable combination can be arranged to control the percentage of upward light and brightness over a considerable area. Thus, units can be selected to give the best lighting effect for your particular installation.

TOTAL THESE FEATURES – AND YOU GET TODAY'S MOST EFFICIENT LIGHTING

For 100 to 500 watt tungsten Lamps, 80-125 watt MB/V Mercury.

Lighting output Ratio exceeds 85%. Balanced distribution — 10-25% upward light.

High mechanical strength — Resists corrosion.

Low initial cost.

Ease of installation.

White stove enamelled interior.

For further particulars or help on any lighting problem write to:

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ENGINEERING & LIGHTING EQUIPMENT CO. LTD.

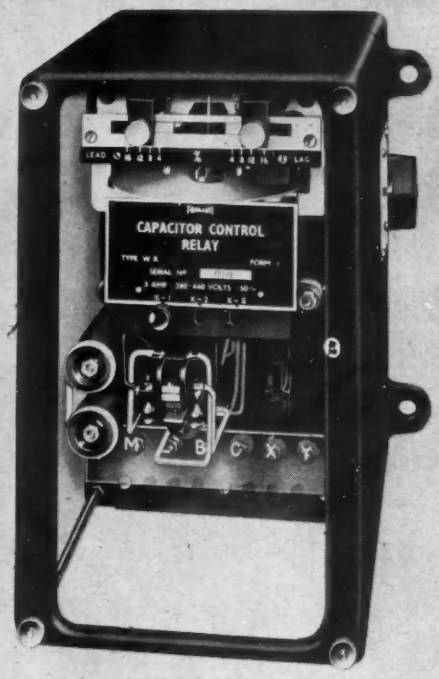
ATPHERE WORKS, ST. ALBANS, HERTS.

FERRANTI

CAPACITOR CONTROL RELAY

(TYPE WR)

FOR SINGLE STAGE CONTROL



This relay provides *automatic power factor correction* when used with suitable capacitors.

- Independently adjustable "lead" and "lag" settings over a wide range.
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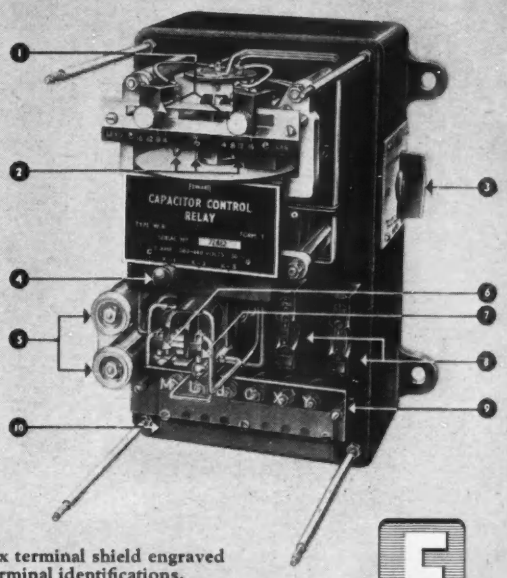

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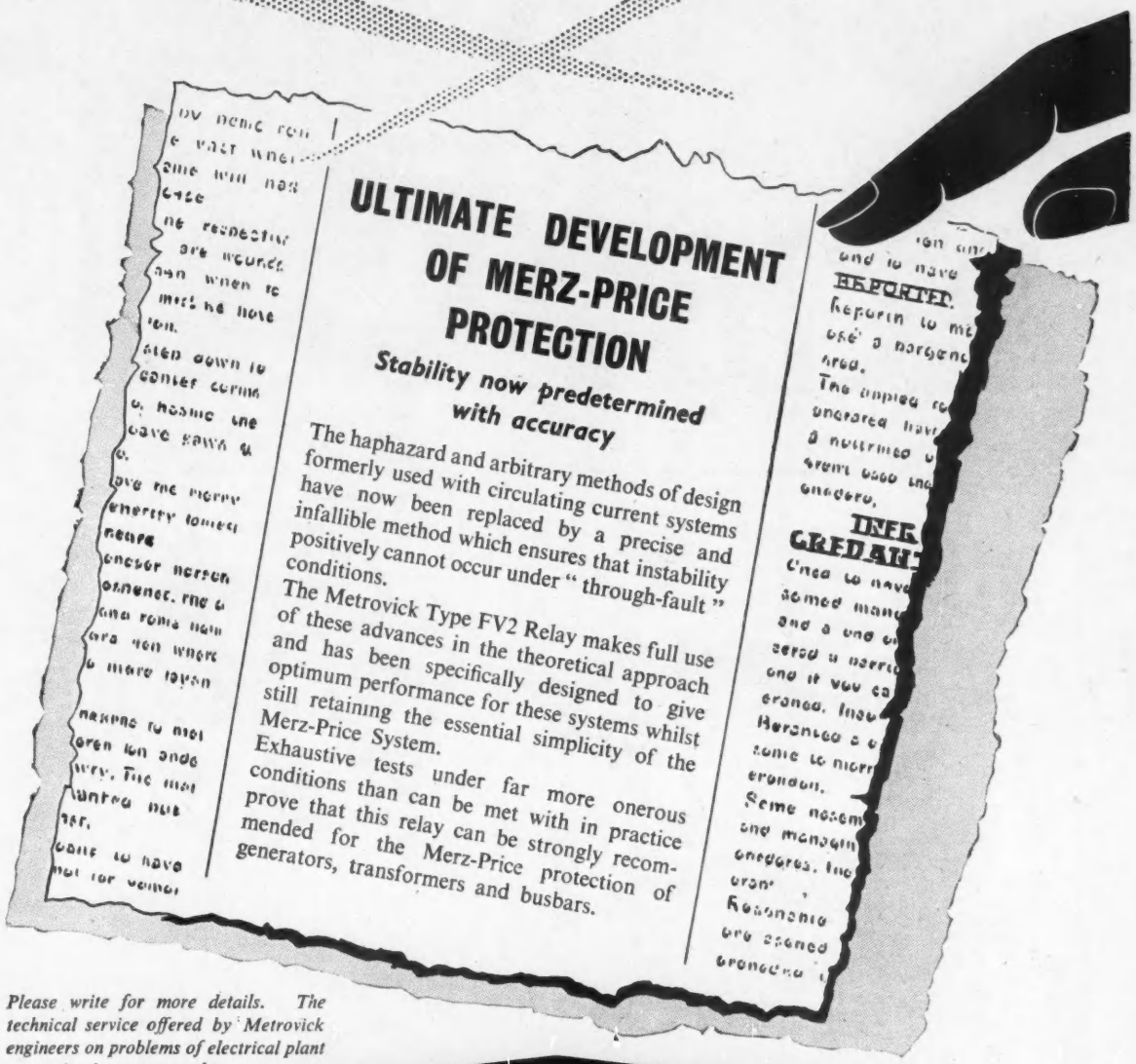
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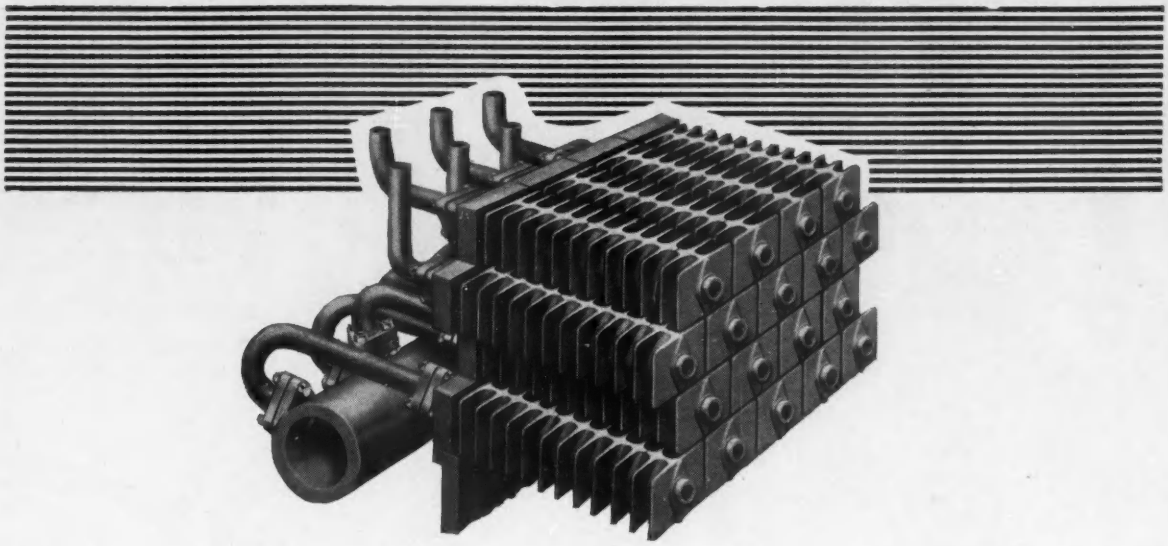

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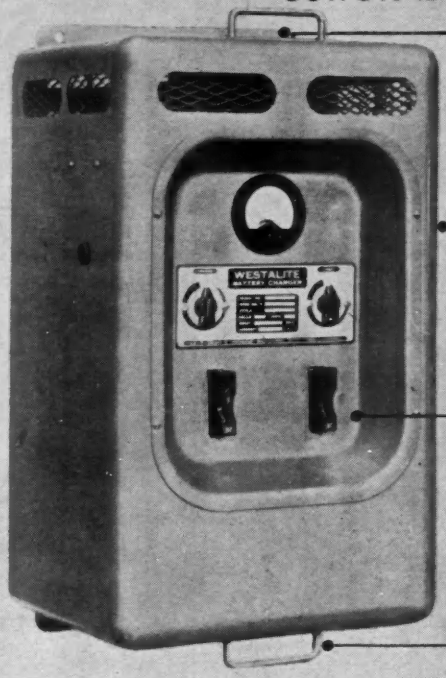

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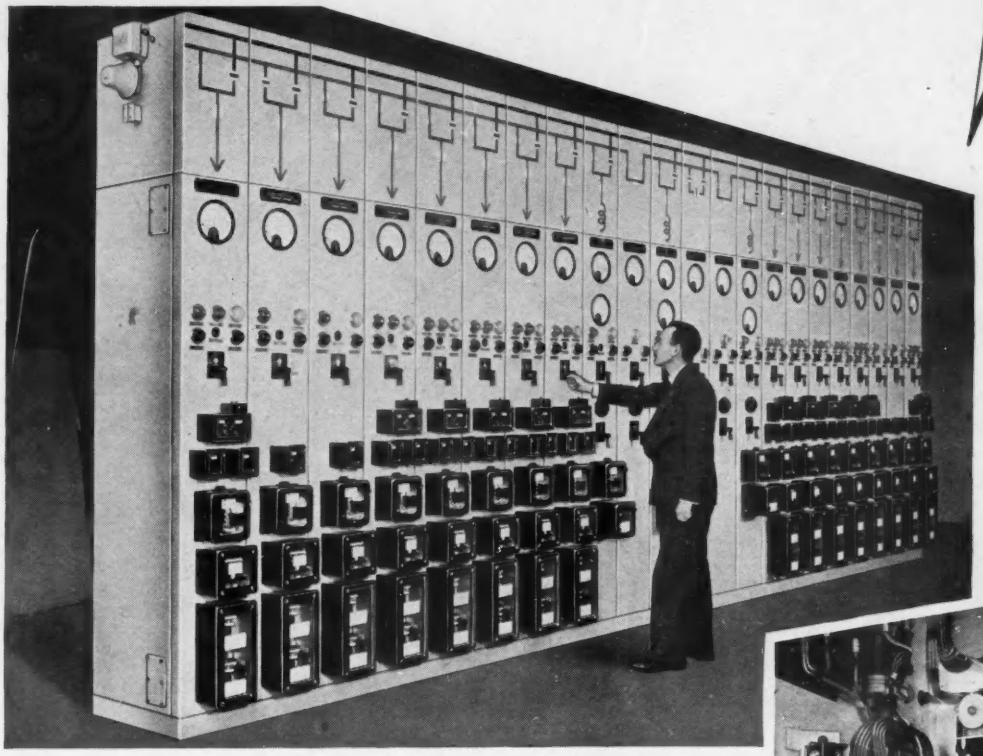

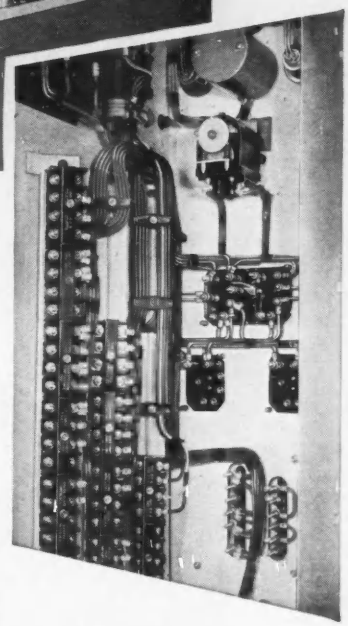

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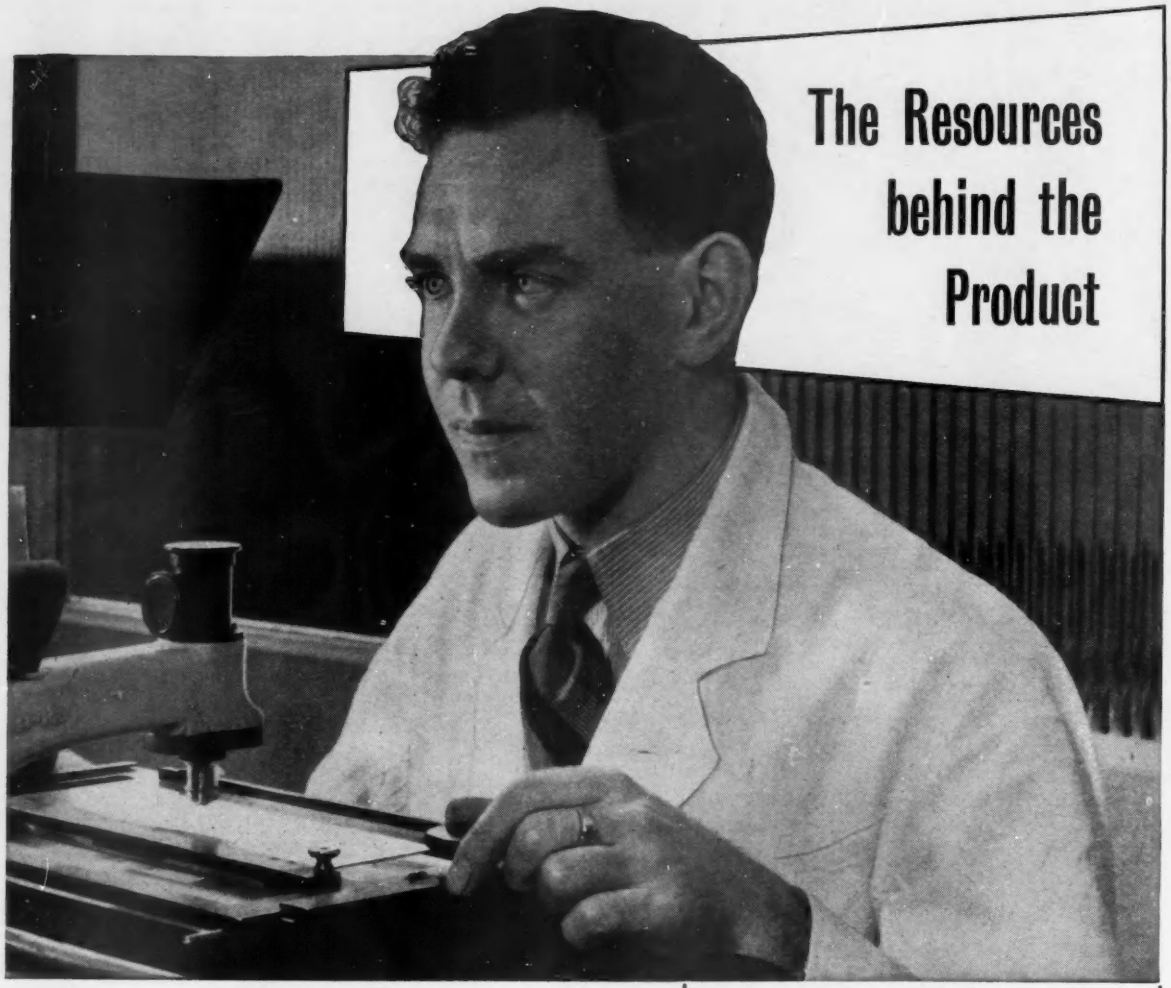

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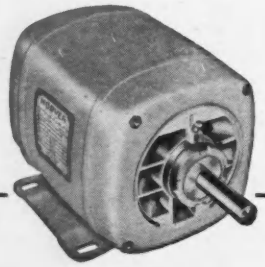

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Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Assistant Editors:
J. K. JOHNSON, B.SC.(ENG.), A.M.I.E.E.
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THE WORLD AHEAD

The I.E.E. Presidential Address this year was one to set minds thinking. Mr Eccles chose as his subject a socio-philosophic study of man's future fuel requirements and drawing on illustrations from past civilisations, showed that population levels are determined by the technological ability to provide the necessary food, clothing and energy to support the people. With present world population at an unprecedented level and increasing at an alarming rate, it is clear that great demands must be placed on our technical ability if the ceiling level on population imposed by limitation of resources is to be kept at bay. Mr Eccles did not concern himself with the basic equation of food and population but with the equally important equation in our technical civilisation, that of energy requirements. Great as our scientific advance has been, it is matched with a profligate use of fossil fuels which had been hardly tapped one hundred years ago; yet we are already contemplating their exhaustion. Mr Eccles places a limit of two hundred years on our coal and oil resources; other, more optimistic estimates put the time for exhaustion up to one thousand years, but either figure is insignificant when set against man's span on earth and leaves but little time to find a solution. Two paths ahead were pointed out. The more promising offered nuclear energy as the principal solution to the equation but the other path, without this source, wandered gloomily amongst tidal and wind, hydro and solar power. Surprisingly little accent was placed on the use of vegetation for alcohol production, a promising additional energy source. But whatever may be the detail of the solution, the challenge is there and if we could not see as much of the byways as we might have wished, it was because Mr Eccles chose as his canvas, the future of the whole world,—a future in which the technologist must join with the sociologist; a future which will require the fullest international co-operation to meet the demands of the ever higher population levels, if they are not to be resolved by destruction.

SATURATION AFAR

Yet another prospect of the future was provided for engineers last week, this time by Mr E. A. Logan who, in his chairman's address to the I.E.E. Southern Centre, chose the more mundane viewpoint of an estimate of the saturation level of electricity consumption. Two separate approaches were made: one a summation of empirical estimates of individual requirements and the other a translation, with suitable reservations, of present day energy requirements into electricity usage. The two figures obtained showed surprising agreement at

approximately 4,700 units per head per annum. Comparison of the individual estimates which make up the totals shows up certain differences, however, the empirical estimate for domestic requirements being higher than the figure calculated from existing demands as one would expect from the continuing expansion of home needs. Conversely, since the overall totals are similar, the estimate for industry is lower in the former case. Mr Logan is undoubtedly right in allowing for greater economy of heat consumption in industry consequent upon electrification, but will not industry's growing demand for power more than counterbalance any such saving? As the years pass, industry is being forced to process ever lower grade ores while at the other end, more specialised materials are coming into use, both these factors tending to increase the demand for energy. The adoption of hydrogen in place of coke for reduction of iron ores would alone increase consumption by some 500 units per head. In the face of such unknown factors, Mr Logan has, perhaps, been right to adopt a conservative outlook in a survey which is the more valuable, since few have had the courage to tackle it realistically.

LIGHT AND LOAD

In the late eighteen-nineties, when lighting provided effectively the only domestic load for electricity supply, yearly load factors were necessarily low, a matter of 10 or 15 per cent. Load building with domestic consumers was mainly a matter of selling domestic appliances, and it has retained this emphasis up to the present day. Is this the reason for the neglect of lighting by service centre sales staff, of which Mr E. C. Lennox complained in Tuesday's Presidential Address to the Illuminating Engineering Society? No-one will suggest that a 100 W lamp is a better sale than a cooker, but from the point of view of load building, change from a 60 to 100 W lamp is likely to mean more than a vacuum cleaner. Moreover, in contrast to its effect fifty years ago, additional home lighting now helps to fill the valleys of the load curves, not to sharpen the peaks. Mr Lennox is quite open in accusing the supply industry of doing too little to encourage its consumers to improve their standard of lighting. If important progress is to be made, however, it will not be possible to rely only on replacing existing lamps with bigger and brighter bulbs. Extra light sources must be introduced to give illumination where required, and that means more wiring. Any renewed emphasis on lamp sales needs to be accompanied by carefully worked-out schemes for making such additional wiring more acceptable in cost than at present.

THE COST OF APPEARANCE

With the post-war commissioning of new power stations, complaints have been heard that architectural treatment is too expensive. Protagonists of this view hold that all that is needed is the necessary plant, weather-proofed where necessary, by a cladding of the cheapest materials. Such an attitude is remarkable in view of the agitation raised several years before the war against just this type of structure. In this country, amenities are still an important consideration, and, although there may be rural sites where a purely functional design can be accepted, in the majority of cases the additional expenditure for an acceptable form of building proves well worth while. Power station architecture is a field of its own, and although there may have been a few cases of over-elaboration, the attention now being paid by the Authority and its advisers to unconventional methods of cladding indicate that it may shortly be possible to reconcile æsthetic requirements with the functional limit of cost.

MONOPOLIES COMPLAINT

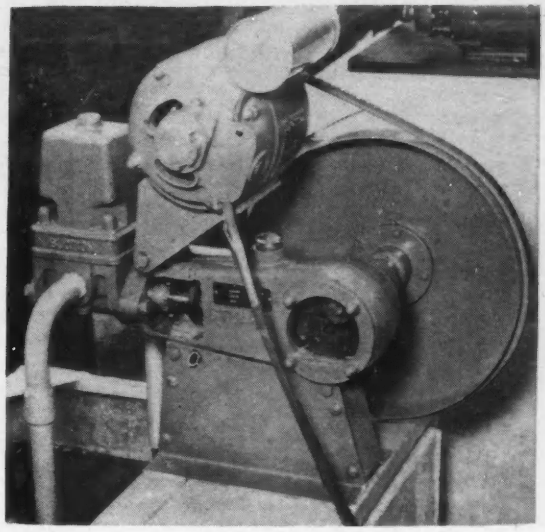
Industry can hardly be expected to like the Monopolies Commission: but it accepts this imposition along with many other unwelcome statutory institutions, and tries to work loyally with them. Loyalty undergoes a strain, however, when back door evidence sways the Commission's findings. This point was well made by Sir Harry Pilkington, President of the F.B.I. in a speech at Sheffield last week. The basic difficulty is that representatives of industries being investigated by the Committee cannot, under its procedure, directly question their "accusers": they are presented with alleged facts, and invited to confirm or refute them without the help of that background information on their source which may enable an answer to be complete and convincing. The electrical industry has certainly suffered in this way and it seems likely to do so again; and the experience leaves a rankling sense of injustice. From this dissatisfaction there springs the greater danger of the present method of working necessarily followed by the Commission. The co-operation and understanding between Government officials and industry which is so essential to our complicated economy, stands in danger of being damaged by the hidden injustices of Monopolies Commission procedure. If the risk is as great as Sir Harry Pilkington suggests, then this aspect of Monopolies legislation should receive early attention.

AFRICAN OPPORTUNITY

South Africa's intention to relax import restrictions next year, announced last week by the Minister for Economic Affairs, provides a welcome offset for the tightening of corresponding controls in Australia, reported in our last issue. South Africa is the largest Commonwealth consumer of Great Britain's electrical exports, and the greater freedom to import both industrial machinery and consumer goods, announced by the Minister, will offer some opportunity for manufacturers to achieve the sales expansion they had hoped to make in Australia. There are, however, important differences between the two markets, additional to those of geographic and ethnologic origin. South Africa's electrical imports contain a markedly higher proportion of industrial machinery as distinct from domestic appliances than do Australia's. This characteristic affects basically the suitability of one of these markets as a substitute for the other. More directly affecting sales opportunities is South Africa's policy of making no discrimination between dollar and non-dollar sources of imports. Thus there will be American competition for the expanded market promised for next year, and although the fifty-cycle regime in the Union must help British electrical firms, they will need to fight hard to realise this African opportunity.

The Theory of Operation and Design Considerations are fully discussed in this article by

T. V. SREENIVASAN,* B.E., M.Sc.Tech (Man) A.M.I.E.



The Metrovick machine, seen above, the power unit of a Stuart-Turner electric piston pump, which provides 240 g.p.h. of water operated against a maximum head of 75 ft, is a good example of a practical application of a capacitor motor

THE CAPACITOR MOTOR

WITH the extensive increase in the use of electric appliances and the increasing popularity of individual machine drives, the need for a good, single-phase, fractional horse power and integral horse power motor is increasingly felt. The capacitor motor seems to be the best of all such single-phase motors available. For rural electrification with the economical single-phase system of power supply, the capacitor motor with its high power factor compares favourably even with the polyphase induction motor. Originally, the chief difficulty with this motor was experienced in securing good capacitors, but in recent years great strides have been made in their manufacture, particularly for the radio industry and power factor correction purposes. With the advent of good capacitors the capacitor motor has become increasingly popular and is rapidly replacing all other types of small single-phase motors, an important development when it is considered that f.h.p. motors have wider application than any other class. Although one of their important uses is in domestic appliances such as refrigerators, oil burners, vacuum cleaners, and washing machines, they are also used widely for office and commercial appliances, and industrially in small air compressors, fans, blowers and similar equipment. Intregral horse power capacitor motors are also used for machine tools, wood working tools, hoists, lifts, tap-change equipment, pumping sets and other purposes.

General Considerations

There are three types of capacitor motor. Firstly comes the capacitor-start motor (Fig. 1 (a)) where the capacitor phase is in circuit only during the starting period. Secondly there is the permanent split-capacitor motor (Fig. 1 (b)) which has the same value of capacitance for both starting and running conditions and the two value capacitor motor (Fig. 1 (c) and (d)) using different values of effective capacitance for the starting and running conditions.

The choice of the capacitor type depends largely on the starting requirements of the motor. For large starting torques

* *The Author is Lecturer in Electrical Engineering, India Institute of Technology, Kharagpur, India.*

NOMENCLATURE

V_1 = Applied voltage (reference vector).
I_1 or I_l = Stator or line current.
I_2 = Rotor current referred to the stator.
I_m = Main phase current.
I_s = Auxiliary or Capacitor phase current.
I_f = Positive sequence Component of the stator current.
I_b = Negative sequence Component of the stator current.
I_{2f} = Positive sequence Component of the rotor current referred to the stator.
I_{2b} = Negative sequence Component of the rotor current referred to the stator.
Z_o = Magnetising impedance.
Z_c = Impedance of the external capacitor $(r_c - jx_c)$. (r_c is usually neglected.)
Z_2 = Impedance of the rotor referred to the stator, $(r_2 + jx_2)$.
Z_f = Impedance of the motor to positive sequence voltages.
Z_b = Impedance of the motor to negative sequence voltages.
$S = \text{Slip} = \dfrac{\text{synchronous speed–actual speed}}{\text{synchronous speed}}$
$a = \dfrac{\text{Effective turns in the condenser phase.}}{\text{Effective turns in the main phase.}}$
X_3 = Reactance of the condenser phase only at standstill.
Z = Impedance of the main phase only at standstill.
R = Resistance of the main phase only at standstill.
X = Reactance of the main phase only at standstill.
R_3 = Resistance of the condenser phase only at standstill.

necessitating large capacitors, the intermittent duty, dry type electrolytic capacitor is used. It has reasonable dimensions but its losses are high and life short if used continuously. It ranges in size from 85 microfarad to 300 microfarad. Capacitors for continuous duty are normally of the paper spaced, oil filled, type, which, although bulkier, has lower losses and a longer life than the dry type electrolytic. It ranges in size from 3 to 16 microfarad.

Theory of operation

The operation of the capacitor motor has been explained on the basis of the revolving field theory by Morrill and on the basis of the cross-field theory by Puchstein and Lloyd. The expressions derived by both these theories are long and complicated and for the purpose of pure mathematical analysis the method of symmetrical components is simpler. Adopting this method with the nomenclature as given and by reference to Figs. 2 and 3 the following vectorial relationships can be established.

The positive sequence voltage, V^+, applied to the motor is given by the expression

$$V^+ = \tfrac{1}{2}\left[V_1 - j\frac{(V_1 - I_s Z_c)}{a}\right] = I_f Z_f \qquad \text{.....1}$$

and the negative sequence voltage, V^-, by

$$V^- = \tfrac{1}{2}\left[V_1 + j\frac{(V_1 - I_s Z_c)}{a}\right] = I_b Z_b \qquad \text{.....2}$$

The positive sequence impedance of the motor, as represented by the equivalent diagram shown in Fig 5(a), is expressed by

$$Z_f = Z_1 + \frac{Z_o(r_2/s + jx_2)}{Z_o + r_2/s + jx_2} \qquad \text{.....3}$$

and the negative sequence impedance, as shown in Fig 5(b), by

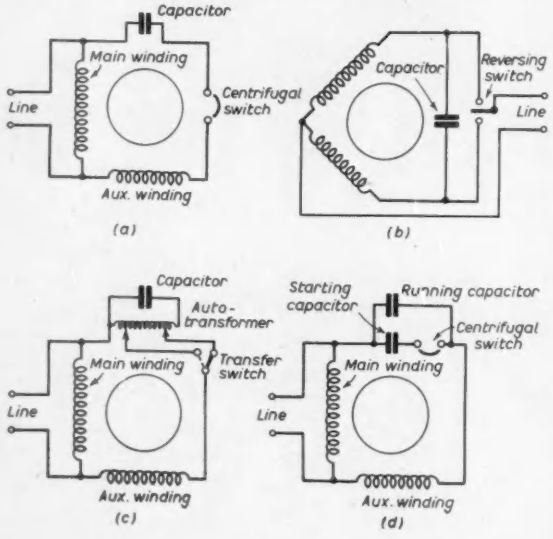
$$Z_b = Z_1 + \frac{Z_o(r_2/(2-s) + jx_2)}{Z_o + r_2/(2-s) + jx_2} \qquad \text{.....4}$$

The positive sequence component of the stator current is thus

$$I_f = \frac{V_1}{2}\,\frac{(a^2 - ja)\,Z_b + Z_c}{a^2 Z_f Z_b + (Z_f + Z_b)\,Z_c/2} \qquad \text{.....5}$$

and the negative sequence component

Fig. 1. Types of capacitor motor, (a) capacitor start, (b) split capacitor and (c) and (d) two versions of the two value capacitor motor



$$I_b = \frac{V_1}{2}\,\frac{(a^2 + ja)\,Z_f + Z_c}{a^2 Z_f Z_b + (Z_f + Z_b)\,Z_c/2} \qquad \text{.....6}$$

From 5 and 6 the main phase current is thus

$$I_m = I_f + I_b = \frac{V_1}{2}\,\frac{(a^2 + ja)\,Z_f + (a^2 - ja)\,Z_b + 2Z_c}{a^2 Z_f Z_b + (Z_f + Z_b)\,Z_c/2}$$

and the capacitor phase current

$$I_s = \frac{jI_f - jI_b}{a} = \frac{V_1}{2}\,\frac{(1 - ja)\,Z_f + (1 + ja)\,Z_b}{a^2 Z_f Z_b + (Z_f + Z_b)\,Z_c/2}$$

From which the line current is given by

$$I_l = I_m + I_s = \frac{V_1}{2}\,\frac{(a^2 + 1)\,(Z_f + Z_b) + 2Z_c}{a^2 Z_f Z_b + (Z_f + Z_b)\,Z_c/2}$$

In a polyphase machine, the rotor current, I_2 is given by,

$$\frac{I_2}{I_1} = -\frac{Z_o}{Z_o + r_2/s + jx_2}$$

Hence in the case of the capacitor motor, proceeding on the same lines I_{2f} and I_{2b} can be calculated.

Then the torque due to the positive sequence current,

$$T_f = \frac{r_2}{s} \times \frac{2 \times 112{\cdot}7}{n_s}\, I^2_{2f}$$

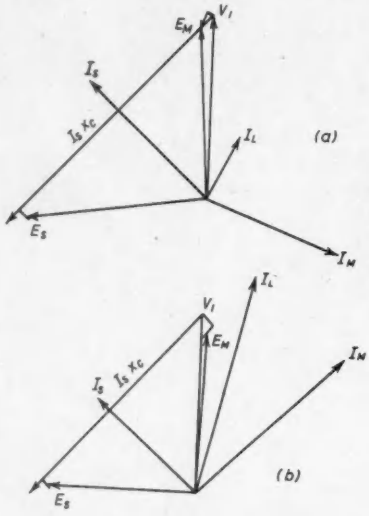


Fig. 2. Vectorial relationships of line, main phase and capacitor phase currents and voltages for (a) positive sequence values and (b) negative sequence values of symmetrical components

and the torque due to the negative sequence current,

$$T_b = \frac{r_2}{(2-s)} \times \frac{2 \times 112{\cdot}7}{n_s}\, I^2_{2b}$$

with the net torque therefore, $T_f - T_b$.

It can also be shown that the locus of the line current is a circle as in the case of the polyphase and single-phase induction motors but the circle is discontinuous between values of slip between one and infinity. Fig. 4 shows the circle diagrams of a motor when run as a two-phase motor, as a single-phase motor and as a capacitor motor. The loci of the phase currents and the positive and negative sequence currents are bicircular quartics as shown in Figs. 5 and 6.

Effect at abnormal speeds

At super-synchronous speeds the capacitor phase still takes in electric power instead of generating as does the main phase. In the reverse direction of rotation, however, the main phase takes in power to produce motoring torque whilst the condenser phase generates.

The main phase current is zero when

$$Z_c = -\tfrac{1}{2}\,[Z_f\,(a^2 + ja) + Z_b\,(a^2 - ja)]$$

For balanced operation, when a true revolving field exists

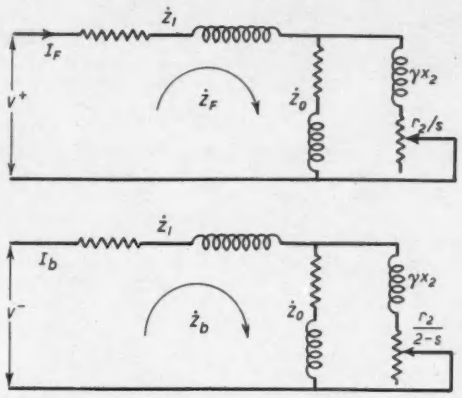


Fig. 3. Using symmetrical components, above shows equivalent circuits of a capacitor motor for (top) positive sequence, and (below) negative sequence voltages

(as in the case of a polyphase motor), I_m and I_s must be equal and at right angles to each other, which means that $I_b = o$. This occurs when the tangent of the power factor angle of an equivalent two-phase motor is equal to the ratio of turns, a, and for this value of slip, X_c must be equal to $Z_f a\sqrt{a^2+1}$.

It is a characteristic of the capacitor motor that the input to the capacitor phase tends to remain approximately constant over normal ranges of load. Hence at light loads the output of the capacitor phase may be greater than that required to supply the necessary torque, and this excess of output has then to be returned to the line via the main phase. Thus the capacitor phase will be motoring and the main phase generating. Under these conditions the losses in the machine are considerably increased and the current waves distorted, as shown in Fig. 8, which depicts oscillograms of the current waves in the line, and capacitor and main phases at light and full load. Even a fairly large capacitance, designed on starting considerations will be detrimental to the motor if left in circuit while running.

Starting Torque

For maximum starting torque the capacitive reactance is given by $X_c = X_s + \frac{R_s}{R}(\overline{Z - X})$

For equal weight of copper in the two windings, $R_s = a^2R$ and the maximum starting torque is given by

$$\frac{QN_1^2 V_1^2}{2aZ^2}\sqrt{\frac{Z+X}{Z-X}}$$

The capacitive reactance for this condition is then a^2Z. Hence if the ratio a is increased, a smaller capacitor may be used but the maximum starting torque is then reduced. As the maximum starting torque is proportional to the volt-amps of the capacitor, it is roughly proportional to its cost.

A capacitor motor can be designed to produce a higher starting torque than an equivalent two-phase motor, assuming direct starting. Starting quantities can be read as shown on the diagram (Fig. 7).

Line current = OA, Main phase current = OB, and Capacitor phase current = BA.

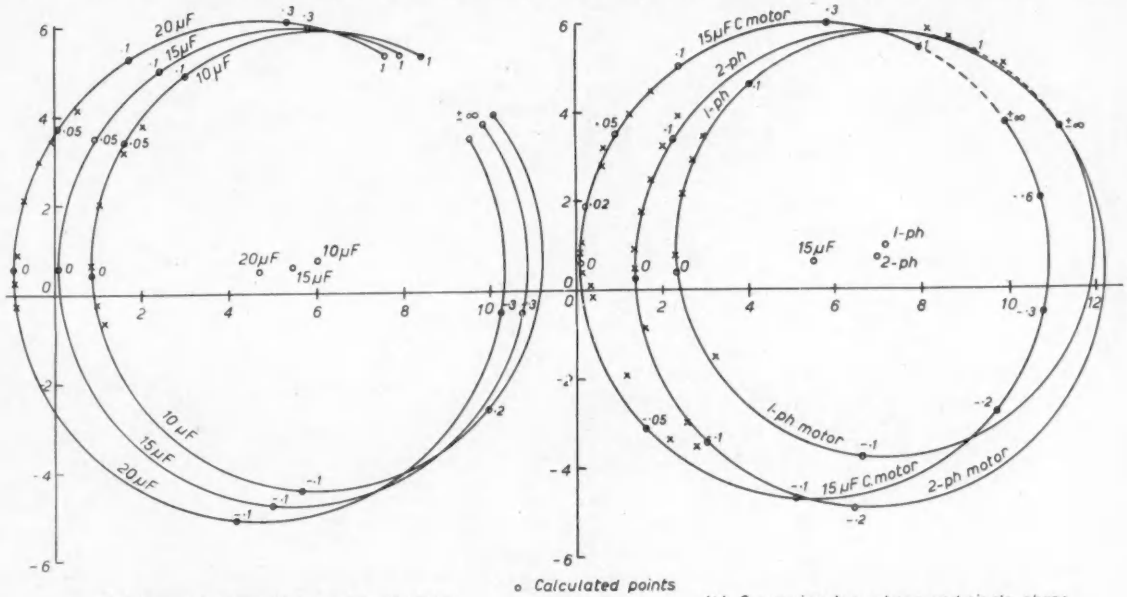
Starting torque = K x AC in synchronous watts where K is a constant.

Performance Characteristics

Figs. 10 and 11 show typical performance characteristics of a capacitor motor. Unless the capacitor has a small value, the main phase current first decreases slightly from the no-load value as the machine is gradually loaded and then increases. Beyond full load it increases very rapidly. The capacitor phase current is at its maximum at no-load decreasing slightly as the machine is loaded.

Up to full load, except for low values of slip, the torque developed by a capacitor motor is a little greater than that of a plain single-phase motor and almost as high as that of a two-phase motor. Beyond full load, however, whilst still exceeding that of a single-phase motor, its torque falls considerably below that of a two-phase motor. This means that the overload capacity of a capacitor motor, although greater than that of a single-phase motor, is much less than in the

Fig. 4. Circle diagrams of line currents (a) showing the effect of capacitance and (b) comparing the capacitor with a single and three-phase motor



(a) Comparing capacitor motors with values of capacitance of 10, 15 and 20 μF

o Calculated points
x Test points

(b) Comparing two-phase and single-phase motors and a 15 μF capacitor motor

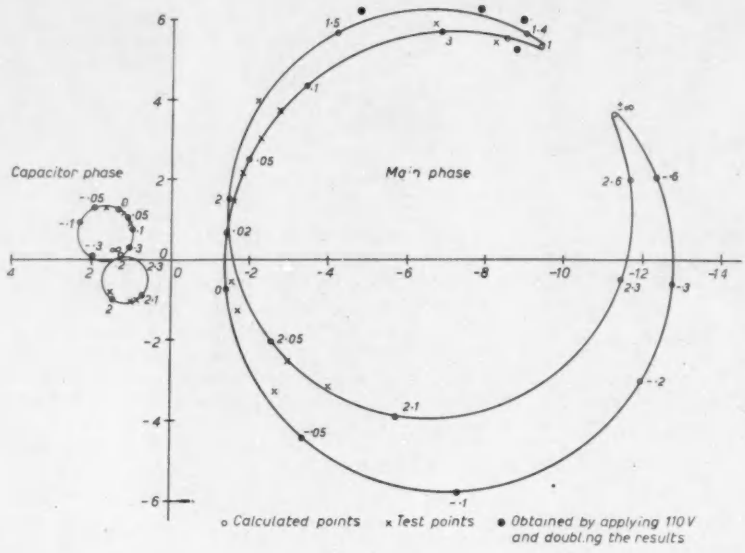


Fig. 5. Polar diagrams of the currents in main and capacitor phases of a 15 microfarad capacitor motor, for both directions of rotation

case of the two-phase motor. However, the overload capacity can be improved by using a larger capacitor.

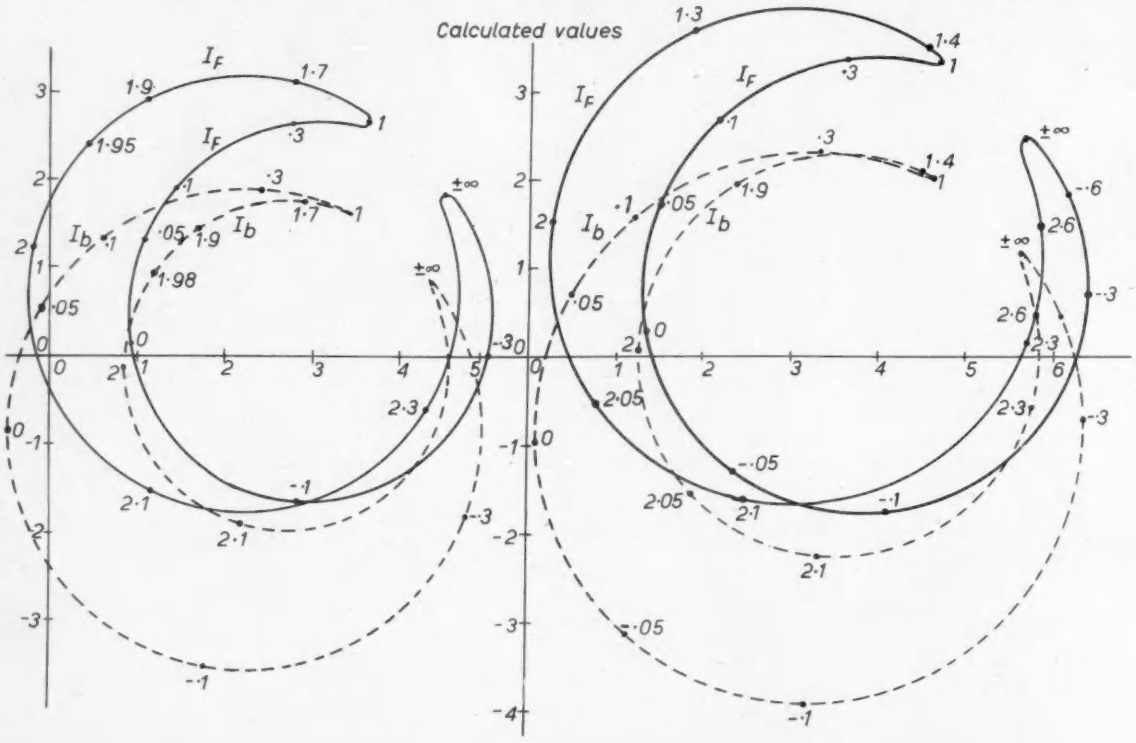
Trickey gives the following formula for the maximum torque. T_{max} (capacitor motor) = T_{max} (single-phase motor) + $\frac{1}{2}$ full load torque × (pull-out r.p.m. ÷ full load r.p.m.

The capacitor phase affects the maximum torque in two ways. Not only does it contribute its share of the torque, but, by relieving the main phase of the magnetising current of the cross-field, it enables the main phase itself to develop a maximum torque greater than that from a single-phase winding alone. In one direction of rotation both effects are additive but in the reverse direction, whilst the second effect remains additive, the first effect becomes subtractive to the torque developed by the main phase. Hence, unlike the plain single-phase motor, the torque characteristic of the capacitor motor is not the same in both the directions of rotation unless the capacitor connections are altered.

The magnitude of both effects depends upon the value of the capacitor and the turns ratio a, although the magnitude of the second effect is also affected by the relative magnitudes of the magnetising current and load current of the main phase at the point of maximum torque. For the second effect to predominate the magnetising current and the leakage reactances must be large, which means that the machine must be saturated. The power factor of the capacitor motor is high even at low loads and remains high over a wide range of load.

With a suitable value of capacitance the efficiency curve of the capacitor motor is almost indistinguishable from that of the polyphase motor, up to full load, afterwards falling rapidly. At light loads, a higher efficiency is obtained with

Fig. 6. Polar diagrams of positive and negative (shown dotted) sequence currents for left; a 10 mfd capacitor and right; a 15 mfd capacitor



lower values of capacitance. With large capacitors the efficiency may even fall below that of a single-phase machine, the reason being the distribution of current between the two windings and the magnitude of I_b.

The main phase and capacitor phase form a closed circuit in series with the capacitor. Hence, if the rotor is revolving due to the action of the load and the capacitance is above its critical value, an appreciable output voltage will be built up, even without external excitation limited only by the saturation of the magnetic circuit.

Capacitance and turns ratio

The capacitance of the auxiliary phase varies inversely as the square of the turns ratio, in general the magnitude of I_s being mostly determined by the value of capacitance whilst its phase angle depends largely on the ratio of turns. The higher the capacitance, the larger is the current and the higher the ratio of turns, the nearer is the capacitor phase current vector to the line voltage vector (Fig. 2). Hence, for balanced operation under these conditions, the angular separation of I_m and V_1 should be large which means the motor must be of low power factor, as a two-phase machine. Thus, if advantage is to be taken of a high ratio of turns (say 1·33) then, as a two-phase machine, the machine must have a power factor 0·6.

For design purposes then, the saturated, low power factor, two-phase motor is the best basis from which the capacitor

Fig. 8. These oscillograms show changes in main and capacitor current waveform at no load and full load

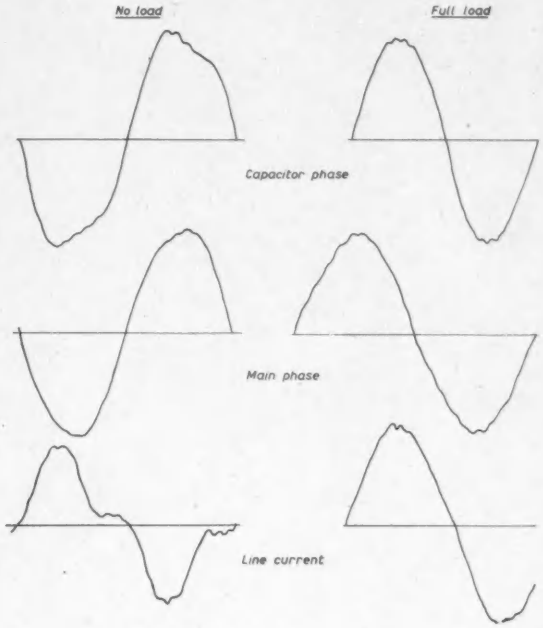
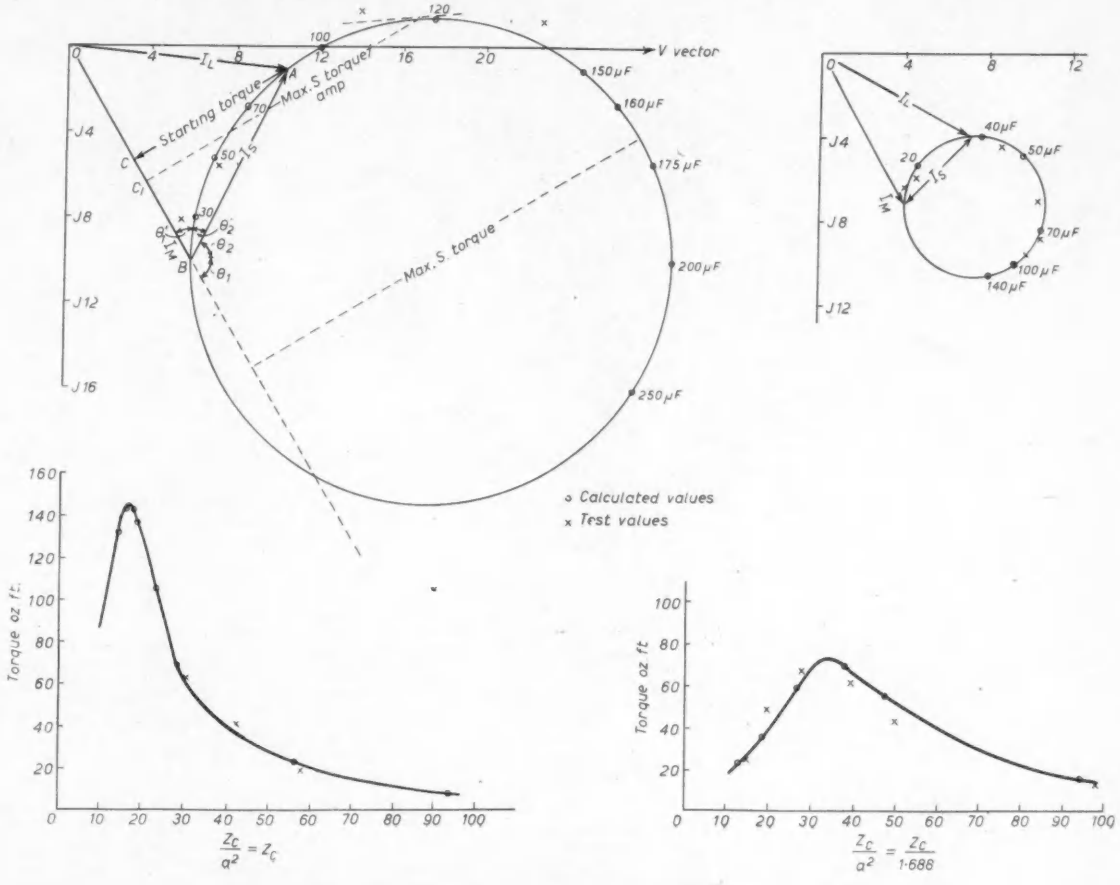


Fig. 7. Circle diagram and torque curve of a capacitor motor for (left) a motor with 10 microfarad capacitor and (right) with 15 microfarad capacitor



motor may be derived. In this way, the designer is able to employ low hysteresis loss steel (as used in transformers), whilst removing the necessity, as is the case with small induction motors, of having to use high permeability steel at high flux densities to reduce the magnetising current.

Factors governing design

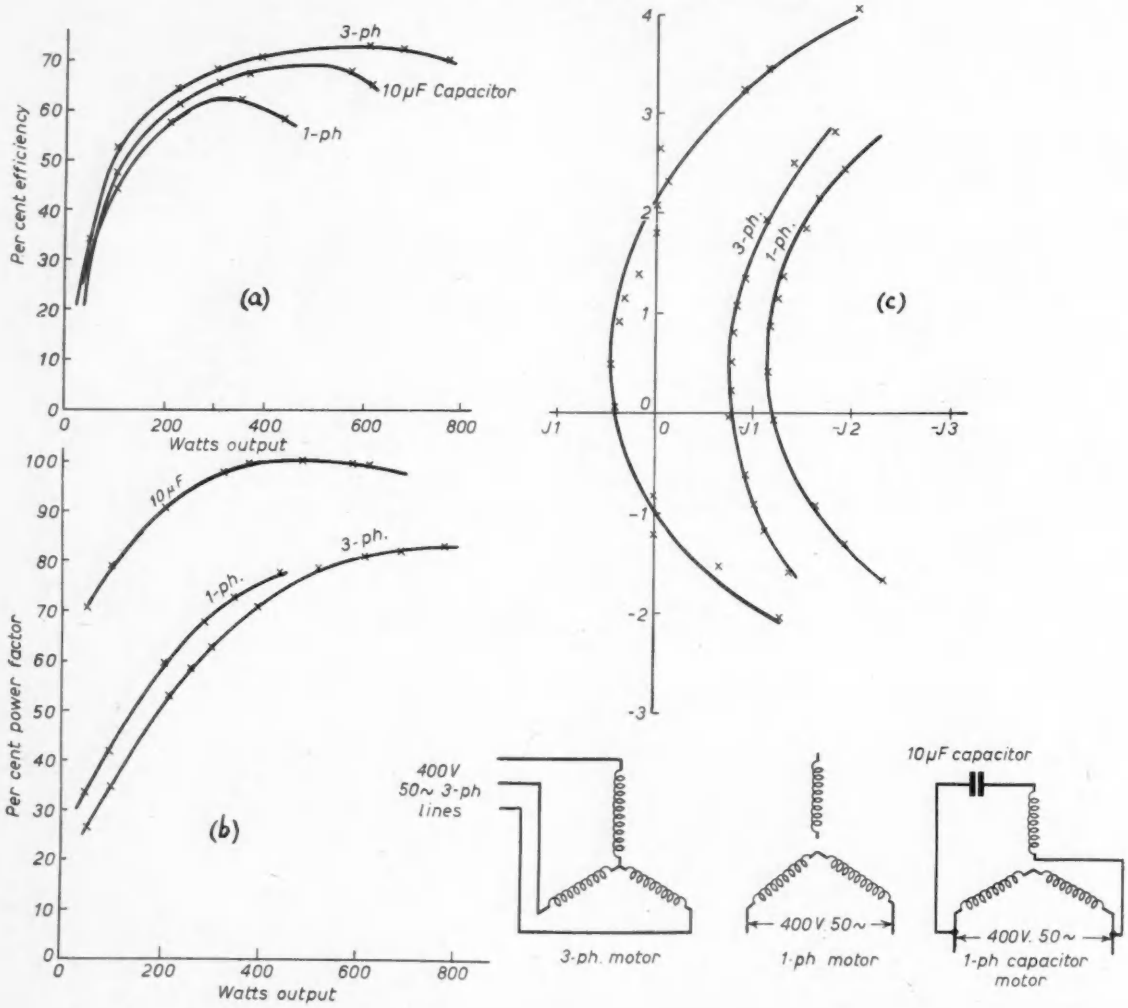
The design of a capacitor motor is entirely governed by the purpose for which the motor will be put into service. If the motor runs mostly at no-load and only for a short time at full-load, then a small capacitor can be used. But if the motor runs largely in the region of full-load, then it can be designed for balanced operation at near full-load, thereby using a larger capacitor with consequent benefits in efficiency, power factor and over load capacity. In these cases, unless the starting torque is very low, a larger capacitor or a transformer capacitor unit has to be used for starting. For motors having an intermittent duty and requiring a large starting torque, a large capacitor has to be permanently connected, a high ratio of turns being adopted to reduce an otherwise unwieldy capacitor.

If equal outputs are expected out of the two phases then it is justifiable to allot an equal number of slots to each. If, however, the motor is to operate under varying load conditions, then it may be found advantageous to design the capacitor phase (whose output remains almost constant) to provide less than half the full-load output and hence to allot less than half the total number of slots to it. Thus, for a single-phase motor under variable load conditions, almost 60% of the total number of slots may be allotted to the main phase and the remaining 40% to the capacitory phase, whilst the ratio of turns can be made between 1·1 and 1·2. Such a motor may give about 30% more output than the plain single-phase motor, its efficiency will be higher (being only slightly less than the equivalent two-phase motor) while its full-load power factor will lie between 0·92 and 0·95.

Comparison of motor operation

Fig. 9 shows comparative curves for a normal commercial 400 V, 50 c/s three-phase motor when operated as three-phase, single-phase, and single-phase capacitor connected as shown. From the foregoing conclusions, conditions are not favourable for operation as a capacitor motor. Firstly the machine is unsaturated as can be seen from the high power factor of the three-phase machine.

Fig. 9. (a) Efficiency, (b) power factor and (c) polar diagram of a three-phase motor when operated as such, as a single-phase machine, and as a capacitor motor. Diagrams inset show the motor connections in each case



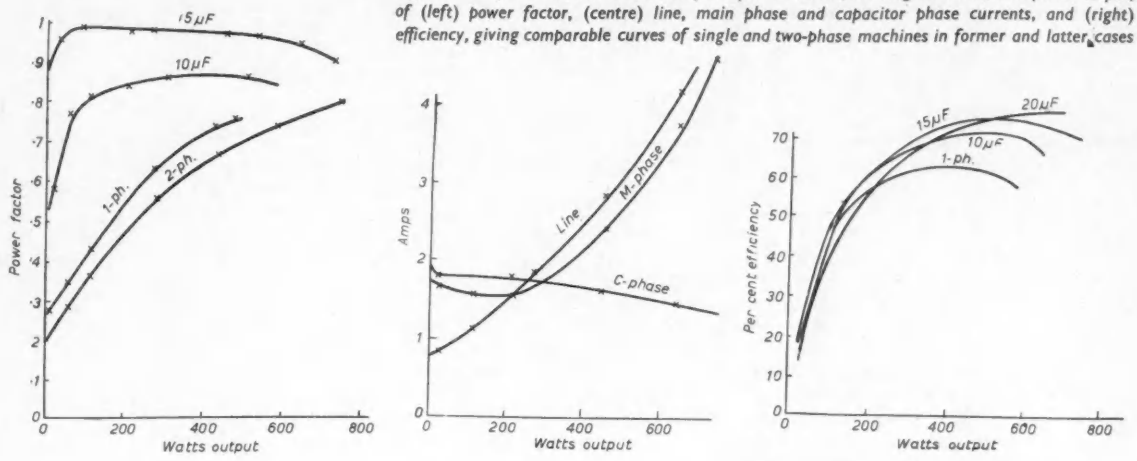


Fig. 10. Performance characteristics of a capacitor motor, showing variation, with power output, of (left) power factor, (centre) line, main phase and capacitor phase currents, and (right) efficiency, giving comparable curves of single and two-phase machines in former and latter cases

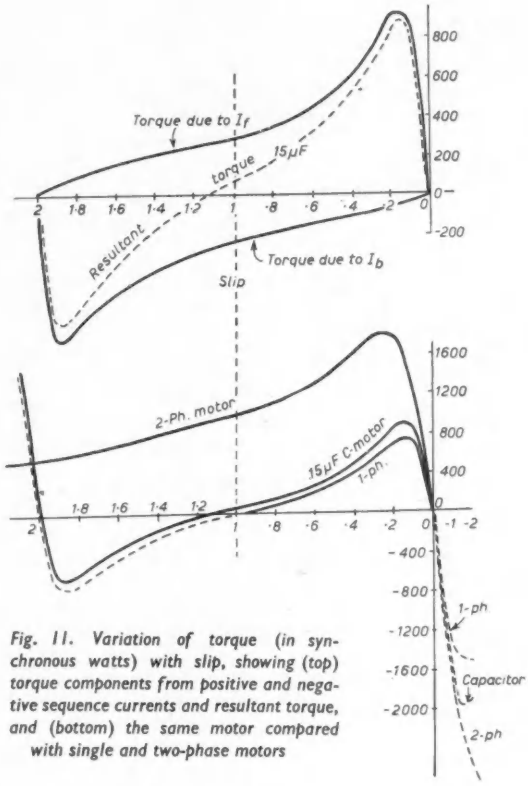


Fig. 11. Variation of torque (in synchronous watts) with slip, showing (top) torque components from positive and negative sequence currents and resultant torque, and (bottom) the same motor compared with single and two-phase motors

Secondly the ratio of turns is less than one, although the size of the wire is the same. Despite these drawbacks, it will be seen that the performance of the machine as a capacitor motor is considerably better than that as a plain single-phase motor. If the voltage were increased so that the volts/turn of the main winding was slightly greater than that in the case of the three-phase machine and a slightly smaller capacitor used, then the efficiency curve would be very close to that of the three-phase machine up to about full-load. But the drawback regarding overload capacity and the advantage of the high power factor remain, whilst in most cases a large capacitor would be necessary for starting.

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MAINS VOLTAGE SAFETY

SPECIAL efforts directed towards expediting work on low voltage equipment (i.e., that operating at 250 V and below) were urged by the executive committee of the International Electrotechnical Commission during a meeting held at Philadelphia recently. The Committee had noted with concern that the absence of international recommendations relating to widely different rules in different countries was a major obstacle to international trade. Work on such equipment is in hand in several I.E.C. committees.

Amongst other topics discussed by the committee were test temperatures and gas turbines. It was suggested that national committees within I.E.C. should be consulted regarding the adoption of a single test temperature (of the order 25° C ± 5° C) for all equipment and applications where special considerations do not apply. It was thought premature to begin work on gas turbines.

Many aspects of the Philadelphia meeting have been reported in the ELECTRICAL TIMES already. Additional work included the classification of insulating materials, in connection with which temperature limits have been incorporated in the well-established O, A, B and C classes, and new test procedures have been suggested; and flameproof enclosures, where some success has attended attempts to bridge the difference between European and North American requirements for maximum permissible gaps.

The next series of I.E.C. meetings has been fixed for London from 28th June to 8th July next year.

POWER IN THE FUTURE WORLD

Mr J. Eccles' Inaugural Address as President of the I.E.E.

THE opening section of Mr Eccles' Inaugural Address to the I.E.E. dealt with Institution affairs. The membership, he said, had now reached nearly 39,000, but the strength of the Institution was derived, not from mere numbers, but from the fact that it knitted together in common fellowship those engaged professionally in the whole range of electrical engineering. He paid a tribute to Mr Brasher and his staff for giving wise and energetic leadership with the maximum practicable degree of devolution of responsibility to Sections, Centres and Sub-Centres.

One of the things causing concern was the inadequacy of the intake of students and juniors to the electrical engineering profession. If science teaching in schools could not be improved and extended, the universities might have to consider selection of entrants more on potentialities than on detailed scientific knowledge, and themselves teach science from an earlier stage. A difficulty lay in the fact that each generation of technologists had to start from the beginning, and early work should thus be rationalised as far as possible. It would seem that the time had come, for example, for the rationalised system of M.K.S. units to be used exclusively in textbooks and academic classes.

Past and Future of Power

Coming to the main theme of his Address, Mr Eccles pointed out that today, due to the exploitation of natural fuel resources, coal and oil, every man, woman and child in this country had the equivalent of 20 slaves to do their bidding.

The record of early civilisations indicated that an improvement in technology had encouraged an increase in population which overshot the capacity of the reigning technology to feed and clothe. In some civilisations, this process took a long time, but even with quite advanced civilisations, almost invariably an improvement in supply technology was accompanied by arrogance or indolence in the governing body which formed the seed-bed of decay. This process came to a head in 500 B.C. when the Babylonian empire ended. In China industrial progress ceased with the full flowering of the Confucian philosophy and in India the caste system divorced intelligence from the industrial crafts. Greek progress died with Alexander the Great. The Greek and Roman civilisations which followed did little to further technological progress.

In the 15th, 16th and 17th centuries A.D. science and technology slowly awakened, the conversion of heat into work being the most significant factor. Later the steam engine was invented and improved, Faraday discovered the laws of electro-magnetic induction and the steam turbine was invented by Sir Charles Parsons.

Coal, oil and natural gas were wasting sources of energy, and, in due course, would cease to exist. It had been estimated that in Great Britain, 25,000m tons of coal had already been raised, and that readily accessible coal only amounted to twice that amount. Assuming a modest increase in consumption, this would only last for 200 years. While the total reserve might be much greater, much of it would be extremely costly to win. As far as oil was concerned, recent assessments suggested that the world reserves of crude oil were only about 5% of the world coal reserves. Annual world consumption of coal was about 1,600m tons, and consumption of oil about 640m tons. Modern trends, however, lent colour to the thought that of all the fossil fuels, oil would be the first to go. A possible oil substitute might be produced from coal synthesis, but this in turn would only accelerate the rate of destruction of coal. What then was the alternative to fossil fuels? The general answer was nuclear power. Without this, the only possibilities were water, tidal, and wind power, solar energy and geothermic heat, with wood, peat and animal wastes as auxiliary contributions.

In water power work one of the most spectacular schemes yet proposed involved a dam across the Straits of Gibraltar with a second across the Dardanelles. The evaporation losses from the Mediterranean were estimated to permit a 70 ft head difference between the Atlantic and the inland sea, and represented a power output of 12m kW. The construction of such a scheme, however, implied the solving of an international problem of political significance.

Tidal power was a lunar function whereas man's existence was based on a solar cycle; fundamentally, therefore, tidal power did not tend to tie in with industrial requirements. Again, wind power was inconsistent, and was limited in extent. Solar energy was under close investigation but was restricted for power production to tropical or semi-tropical areas. The real necessity was to master the fission or fusion technique for nuclear energy if civilisation were to endure.

Nuclear Power

Einstein had calculated that the annihilation of one pound weight of matter would release energy equal to 11,340m units of electricity. Were such complete conversion possible, six lb of matter would release energy equivalent to the whole of the electricity production of Great Britain over the last year. No means had yet been found to accomplish this. It was, however, possible to release a tiny fraction of the mass energy by persuading a heavy atom to divide into two other atoms with a combined weight somewhat less than that of the original or by persuading a number of light atoms to combine to form one with a weight somewhat less than that of the sum of their individual weights. The division of uranium into two lighter elements or the fusion of hydrogen into helium, for example, offered possibilities of release. The potential energy from hydrogen-helium fusion was immense but at the moment the great temperatures involved made this unsuitable for industrial work. The uranium reaction was thus left and it was estimated that the availability of uranium was such that at £50 per lb sufficient could be produced to satisfy—using breeder piles—the energy requirements of man for 1,500 years.

On the same basis, an expenditure of £100 per lb of pure metal on the less productive ores, should provide enough uranium to last another 8,500 years. These were of course only general figures. There were, however, still many problems to be solved.

As coal and oil approached exhaustion, a possible balance might be found by harnessing all the water power of the world and meeting local requirements from this source. Where there were local surpluses of power, the energy could be used to purify fissionable material which could be transported as fuel to other areas where fuel was running short. As far as could be seen at present nuclear energy would be made available to the people as electricity. Electric transport would assume a new importance.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

An Unusual Accident

RECENTLY one of our service men met with an accident, the cause of which was found to be unusual and I am sending you the details as they may be of interest.

Two aerial services (A and B) had been run to the same premises from different sections of an overhead L.T. network. It was proposed to remove one of the services, (A). This service was made dead and an employee proceeded to disconnect the insulated lead-in from the overhead conductor at the wall insulators, standing on a ladder to do so. On separating the neutral, he received a severe shock from hand to hand. He did not lose consciousness but could not release his grip and had to be pulled away.

Subsequent investigation showed that on a lighting circuit (which included a bell transformer) fed from the other service (B), the neutral had broken in a lead-covered twin cable at some previous time and the contractor, in order to effect a cheap and quick repair, had run a length of single core cable from the neutral in a junction box fed from service (A) to a junction box in the faulty circuit. There were no lights in this circuit switched on at the time of the accident, but the employee was in series with the primary of the bell transformer.

E. A. Lawler,
Public Relations Officer.
ELECTRICITY SUPPLY BOARD, EIRE.

Brunswick Wharf History

I HAVE read with interest the article on the Brunswick Wharf Power Station in the current issue of ELECTRICAL TIMES, but I looked in vain for some mention of the man really responsible for the original conception of the scheme.

Let me, at least, pay my tribute to Bob Illingworth, O.B.E., M.I.MECH.E., M.I.E.E., the man who had the vision to see the possibilities of the old East India Export Dock and the initiative, courage and determination to overcome prejudices in high places, and almost every other conceivable difficulty in order that Brunswick Wharf should become the reality it is today.

This all started not in 1943 as stated but in 1939 before the War and would have been no more than a "good idea" were it not for the special qualities as a leader possessed by Bob Illingworth, then Borough Electrical Engineer and Manager for Poplar, and the able assistance of W. T. Andrews, A.M.I.MECH.E., A.M.I.E.E., his Deputy.

In these days when the accent in the National Press appears to be on the lack of initiative and foresight in modern commerce and engineering, whether nationalised or not, let us pay tribute to those who have proved themselves to be leaders in every sense of the word.

S. G. Christian,
EWELL, SURREY.

Static Electricity

I WAS forcibly reminded of recent correspondence concerning the generation of static electricity when a new bank of steam cleaning hoses was erected at a factory. These hoses were for the purpose of cleaning machine parts, and were made up of ½ in. bore rubber steam hose connected at one end to a 100 lb/sq in. steam header and at the other to nozzles formed of ¼ in. bore steel tube.

The fitter who had erected the arrangement reported that on touching the controlling valve of the first hose to be connected up he had felt a severe shock, and was afraid that the supply pipe which had been passed through a hole freshly cut in a brick wall had somehow fouled an electric cable. However, on trying out the arrangement myself I felt no shock. It was then realised that the fitter was wearing rubber boots, whereas I was not, and also that the shock could only be felt while steam was issuing from the nozzle. On changing into rubber boots myself I also felt a fairly violent shock when holding the hose near the nozzle in one hand and touching the steam valve with the other.

The explanation was that the nozzle was generating a charge which leaked to earth via the soles of ordinary shoes quickly enough to prevent a high potential arising between nozzle and earth. Gum boots did not conduct the charge away. A cure was effected by earthing the nozzle to the steam main via a stranded copper conductor run inside the steam hose.

F. J. Halligey,
DURBAN, SOUTH AFRICA.

Filling Compounds

IN his letter in your issue of 23rd September, Mr E. A. Deacon refers to certain aspects of the production and marketing of filling compounds with which I am in complete agreement, but, as he suggests, they would have been less appropriate to my article.

Mr Deacon says that compounds of asphaltic petroleum bitumen base have been in constant use in 33 kV cable joint boxes for the last 30 years: this statement is not necessarily incompatible with my own, that bituminous compounds have been adopted on a modest scale only for 33 kV. There is much evidence that accessories for this order of voltage continue to be filled, in this country and abroad, more commonly with oil/rosin compounds.

With regard to Mr Deacon's suggestion that an impulse test should be introduced, I would point out that the intrinsic impulse strength of good compounds, bituminous and others, is so high that there is probably more scope for improving accessory performance by the wider adoption of sound filling practice.

A. King,
B.I. CALLENDER'S CABLES,
BELVEDERE, KENT.

An Installation Problem

MEGOHM in his article of 23rd September issue, informs us that, at last, there is a tool on the market for tightening up ring-bushes in loop-in boxes. Whilst this will be greatly appreciated, it also raises the old controversy about the lock-nut and ring-bush method being greatly inferior to the use of a socket and male bush. The fact that the ring-bush cannot be effectively tightened with normal tools often leads to a bad continuity test, its only advantage being cheapness. Unfortunately, in certain circumstances it is not possible to use a socket and male bush e.g. on thin Bison floors or narrow joists, where the conduit cannot be set sharp enough to allow for the addition of a socket.

The answer to this problem appears to lie with the manufacturers. It has often puzzled the writer why ring-bushes are not made with hexagon sides instead of having smooth sides, or, at the best, ribbed. Perhaps a manufacturer might like to comment on this.

W. Satchwill,
EASTBOURNE.

around the trade

by Peregrin

ONE of the blessings of this electrical business is that, like Cleopatra, but not quite for the same reason, custom cannot stale its infinite variety. I had a new example of this welcome variety recently when I visited a prominent retailer and found his showroom filled with unpleasant heat, accompanied by equally unpleasant smell. He smiled, and without waiting for the inevitable query, explained that the discomfort was caused by the "ageing" of oil-filled radiators. It seems customers have complained that these appliances fill the place with noxious fumes for a day or two, when first used, so my friend has made it part of his service to remove the nuisance at the source, before delivery. Naturally I asked, would it not be more seemly to perform this malodorous ageing in a place remote from sensitive nostrils, but he claimed that it was a good advertisement. Customers enquired what was going on, and the explanation not only impressed them with the dealer's thoughtful service, but made them interested in electric radiators.

Why must electrical appliances start their career in this unsavoury manner? Fires, convectors, irons, motors, even bed warmers, usually demonstrate their unmistakable newness, in a way that cannot please even the least fastidious. Most of us like the smell of a new car, strangely enough, but prefer an electric heater to be seen and not smelled.

All the same, the fluid-filled radiator is a boon, and one with a bright future. It is one of the most efficient means of heating. Customers are inclined to raise eyebrows at the price, but it is not dear in the long run. A domestic central heating system for only six radiators would cost up to £250. It needs fixed pipes all over the place, and someone to stoke the boiler, with fuel that is not cheap and has to be stored somewhere. The radiators are fixed, and very likely in the way of furniture. Oil radiators would cost less than half, as, being portable, not so many would be needed. They can be placed where required and connected to the existing electrical installation. Besides, when eventually you leave the house, you don't have to make a present of the heating system. You can take it with you.

Safe Blankets

It is remarkable how the electric blanket has become a best seller. A few years ago it was regarded as a luxury or a freak, and by the timid as something almost lethal. Nowadays it is becoming a normal feature of the household and a pet of the housewife. Even the hardy male has ceased to scoff, and grudgingly shares its comfort. Wholesalers have an amazing stock, from the small heating pad to the full size "mattress" which can remain uncomplainingly *in situ* through the winter, without removal or attention. Wise retailers are now stocking up in preparation for the winter. No amount of leaflets and explanation make up for a display and demonstration, and this appliance is so attractively made up and packed that it almost sells itself.

Those who still have misgivings about the safety of the electric blanket should see them tested at the E.D.A. torture house. There they are continually exposed to ingenious cruelty, and the wonder is that any of them manage to survive. Those that do may safely be offered to the most cautious consumer.

Meters for Sale

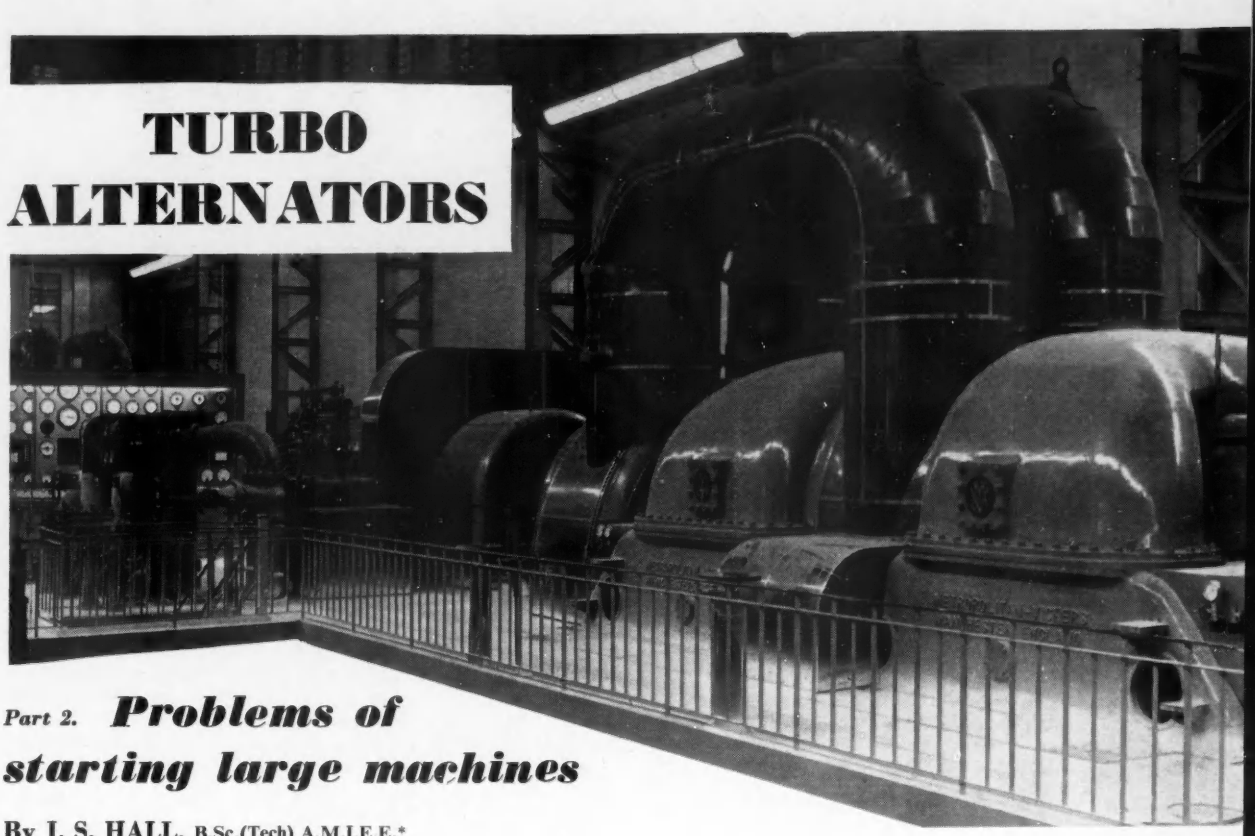
Electrical wholesalers stock everything under the electrical sun, and one never goes to them in vain. Well—hardly ever, for they do not seem to favour that handy device, the house service meter, probably because it is regarded as an "instrument" and thus a sort of speciality. It is nothing of the kind. The small meter, especially the prepayment, is in great demand, as any lively electrical contractor knows. Hotels, boarding houses, flats, caravan sites, divided houses, lock-up shops, all present a ready market for a meter that will do away with guesswork and present the tenant of part of a house or one room only, with an accurate account of his current consumption.

The electric meter has the distinction of being practically the only commodity that pleases all the parties concerned. Consider its virtues. The manufacturer no doubt is pleased to sell it, but the contractor should be delighted, for here is an article which carries no purchase tax, which cannot be bought at ironmongers and furnishers, does not deteriorate in stock, does not falter under scandalous overloading, demands very little subsequent service, yet requires installation by the specialist; in fact it nearly always produces a profitable wiring job as the wiring usually has to be adapted to accommodate the meter. The landlord is pleased, partly because he will be free of disputes over arbitrary charges for current used, but mainly because he will recover the cost of the meter from the profit he makes on the price per unit, seldom less than 1d. and often 2d. or 3d. The tenant also is well satisfied, for he is suspicious of the standing charge method of assessing his electrical appetite and with a meter he will only pay for the energy he actually uses.

There are many types and sizes. The "quarterly" type is quite straightforward, and the landlord only has to read the dials now and again and demand appropriate payment from his tenant. The slot meter is more versatile. It can be obtained for use with a choice of coins or for one coin only, and it can be fitted with a variable tariff device which enables the landlord to alter its price per unit, according to the cost of living or his mood of the moment.

Several firms make meters exclusively, and other large manufacturers include them among their varied products, while there is also an extensive trade in reconditioned meters at very reasonable prices. Which explains the reason why wholesalers do not stock meters. It has always been the policy of meter manufacturers to supply direct to users, usually supply undertakings, and suppliers of secondhand meters have followed suit, so wholesalers would find no advantage in stocking them. Nevertheless, retailers and contractors will find no difficulty in obtaining all the meters they need, at a worth-while discount, and this profitable little sideline should not be ignored.

TURBO ALTERNATORS



Part 2. Problems of starting large machines

By J. S. HALL, B.Sc.(Tech) A.M.I.E.E.*

IN a previous article, published on 23rd September, Mr Hall described the components of large machines which are mainly concerned in the problem of running-up, and considered some of the thermal effects which lead to distortion and vibration. Here, the question of rotor distortion, which was partially considered in the previous part, is further dealt with, and specific examples of starts on a large machine are described and analysed.

Where the temperature of the incoming steam can be controlled (and this, of course, applies to all steam supplies, including gland steam and flange steam, as in a unit plant with effective superheat control) the temperature difference requirement can be observed, and smooth rapid starts are assured.

It will be clear that transient bending due to transverse temperature gradients is random in character, and again each machine must be considered on its merits.

Perhaps it should be reiterated at this stage that only transient types of bending are under discussion, that is, those types of bend that develop during the heating process, but which can be controlled and disappear when the machine is on normal load. Provided they are controlled, the bends will never be of sufficient magnitude to cause damage. If they are allowed to develop, they may well increase until a touch occurs, and then the local heating may be so severe that local compression takes place, so that when the rotor cools again or reverts to its normal temperature state it is pulled into a bent condition with the rub on the concave side.

Transient thermal bending is not generally found in low or even medium temperature rotors. As the temperature increases, so does the proportion of the rotor length devoted to glands. Both these factors increase the tendency to transient thermal bending, and in consequence it is a problem that has increased in importance as temperatures have advanced into the "high" region.

Further, high temperature machines are usually large machines, but the amount of bending that can be tolerated is independent of size, so that on this account also, high temperature rotors are relatively more sensitive to bends.

Thermal Instability

We cannot leave this question of rotor bending without reference to "thermal instability." It appears that there are rotors that exhibit a most troublesome type of behaviour, developing a bend when hot but straightening again when cold. As is well known, there is now a fund of experience on high temperature lathe annealing of rotor forgings. Most rotors bend during this treatment, owing, of course, to the release of locked up forging or machining stresses, but within the experience available to the author it is very doubtful if there has been a single instance of a rotor to which the term "thermally unstable" could be applied with any real meaning. The bend that takes place during the treatment is a genuine stress relieving process. It represents the stress relieving that would have taken place in the rotor over many years of actual service. In high temperature rotors it might have shown sufficiently in a few years to affect the balance, but in medium temperature rotors it is unlikely that it would ever have been noticed. The treatment is valuable, because it occasionally reveals a forging with more locked-up stress than usual, and, of course, if a "rogue" rotor came along, it would be

*Assistant Chief Engineer, Steam Turbine Department, Metropolitan-Vickers Electrical Co., Ltd. This concludes the article, the previous part of which was published on p. 426 of our issue of 23rd September. The article is based on a lecture given to the E.P.E.A. by the author and Mr G. Howarth.

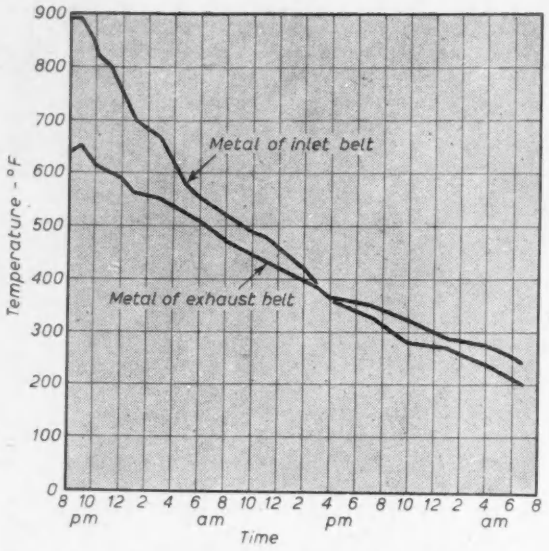


Fig. 5. Observed rates of cooling on shutting down after running on full load

detected. The point to be made is that the "thermally unstable" rotor is so exceptional that it need not be considered as a factor affecting starting technique.

Other Causes of Vibration

Thermal bends in rotors, whether in existence at the start of running up or developing during the run-up, are probably the most likely to cause damage and require careful vigilance. There are, however, a number of other causes of vibration, which can be troublesome although not usually dangerous. A shaft running in a bearing takes up a position dependent on the viscous forces in the oil, and the weight supported. If there is an out-of-balance force present, the effect is to produce a varying resultant force changing in direction as the rotor revolves. This varying force causes the journal to move in the bearing, and, because gravity predominates, the path it describes is roughly an ellipse. Any revolving force has a similar effect. It has already been noted that bearing clearances are large compared with the displacements required to produce appreciable vibration.

It is probable that flexible couplings are one source of such revolving forces. Where there is mis-alignment, the coupling will do something towards allowing the two shaft ends to run on their centres, but at best the balance between torque, hydraulic forces in the bearings, and coupling friction will leave some residual cranking revolving with the shafts, and consequently there may be vibration.

Similarly, inaccuracies in the coupling itself will produce revolving cranking, and hence vibration. The effect of increasing torque is usually to pull the shafts more into line, and vibration is often more noticeable at low loads. It seems to be a characteristic of this kind of vibration that the path forced on one end of the shaft is restrained at the adjacent bearing, and it therefore tends to appear at the other bearing as a similar path but in the opposite phase. The centre of mass of the rotor is not greatly deflected from the axis of rotation. There is a couple, but vibration is not of a heavy type. There have been instances where such vibration has been eliminated by suddenly dropping load and then reloading. It is believed that this gives the coupling an opportunity of re-adjusting itself to a more true alignment.

High pressure turbines are usually mounted on radial keys, but low pressure turbines operate at a low temperature and do not require this type of construction. They are usually supported directly by feet placed two or three feet below the rotor centre line. However, during starting, they may run at low vacuum, which will cause them to be hotter than normal, or they may run for a prolonged period at medium vacuum, at full speed but on no load, under conditions where windage will cause heating. Either of these circumstances will cause the l.p. rotor bearings to rise with respect to coupled rotors, and temporary rough running results from the consequent mis-alignment.

A number of causes of vibration may be operating at the same time. Where the bending is thermal due to non-uniform heat flow through interfaces, it may be complex in itself, and to this may be added, or subtracted, any of the other causes of vibration or damping, whether due to slight unbalance or to other mechanical or hydraulic effect. Turbovisory gear, as at present fitted, cannot distinguish between simple and complex bends. With this in mind, it is an important observation, based on a wide experience, that whereas turbovisory gear often gives an exaggerated indication of the effective bend, i.e. the effective mass displacements, there is no known instance of the gear underestimating the effective bend, if simple bending with no movement at the bearings is used as the criterion.

Starting Temperature Level

The foregoing discussion has indicated that rotor vibration is the controlling criterion limiting the rate of run-up at the present time. It has also been observed that temperature difference is an important cause of rotor vibration. The temperature by which a turbine has cooled, relative to the length of time since shut down, is therefore useful information. Fig. 5 gives an example of a cooling curve. The readings were taken on the h.p. cylinder of a 50 MW machine similar to that shown in Fig. 1. After six hours the inlet end of the cylinder had cooled by about 200° F, and after twelve hours by about 350° F. Note that the exhaust end of the cylinder cooled continuously almost from the shut-down, i.e. the exhaust and lost heat more rapidly than it received it from the hot inlet end.

Range Starting after 6 hr. Shut-down

A range-supplied turbine which will accept steam at temperatures up to 250° F above the metal temperature should therefore start readily after a 6-hour shut-down, if its cooling curve is similar to Fig. 5. A record of a start on such a machine after a 6-hour shut-down is given in Fig. 6, which shows the steam temperatures, inlet end metal temperature, speed, load, and eccentricity of h.p. and i.p. rotors. Steam was taken from a range at 925° F, although owing to the cooling effect of the piping between boiler and turbine, the full temperature would not reach the turbine until perhaps half an hour after the start of rolling. The run-up took about 30 minutes, and the machine was on full load in a little over 50 minutes. This is the run-up during which the cylinder temperatures already shown were observed. It has already been noted that there was nothing in the cylinder temperatures to suggest that a minimum starting time had been reached, and it will be seen that rotor vibration, as indicated by the eccentricity records, was also well within tolerable limits. The h.p. eccentricity, such as it was, reached a maximum before the i.p. eccentricity reached its maximum, suggesting that both of these eccentricities were produced by an advancing temperature effect.

It should be remarked at this point that it is not the purpose of the author to encourage unduly rapid starting. Careful control must be exercised throughout, in order to maintain the machine in first class condition. For instance, a fairly heavy gland rub, although it may clear itself and soon be forgotten, may permanently increase the steam consumption quite seriously.

After a long shut-down, when the turbine is much cooler, it may be necessary to exercise some patience in reaching the stage where the turbine will accept full range-temperature steam in appreciable quantities. This is a real difficulty. Heating up is very slow with a small steam flow. On the other hand, if the steam flow is increased, the rotor is liable to develop vibration, and at the same time it will increase in speed—two entirely incompatible effects. The larger steam flow heats up more quickly, of course, and it is the heating rate that determines the onset of vibration. After a short shut-down a fairly rapid start enjoys the benefit of the cooling effect of the piping. After a long shut-down, this benefit has been lost before the turbine has reached a general temperature level at which it is insensitive to the full steam temperature. As far as can be seen, this situation must be accepted, and where a rotor shows a tendency to vibration, due patience must be exercised.

Provided the speed is low, eccentricity can be tolerated, and it follows, therefore, that some advantage in accelerating the heating process may be obtained by holding the vacuum as low as exhaust casing temperature will permit (say 150° F) and thus cause more steam to flow for a given speed. In a 3,000 r.p.m. machine, it is possible to be a little indifferent to eccentricity up to say 500 or 600 r.p.m., but at higher speeds, the eccentricity must not be allowed to persist. However, the difficulty of removing eccentricity, once acquired, may make it preferable to go a little slower in the initial stages, and thus avoid eccentricity. Whatever benefit can be obtained from the cooling effect of the piping should be fully utilised, which probably means admitting steam to the turbine and starting rolling soon after auxiliaries on the same pipe line have been started. Excessive blowing of steam through drains prior to starting may be inadvisable if it has the effect of raising the steam temperature too quickly. The use of gland steam depends on the design of glands and the supply arrangements. The object is to get as much steam as possible to flow through the turbine at a temperature say 150-250° F above the metal temperature. In these range starts, if reasonable use is made of drains there is not likely to be trouble due to water. The usual difficulty is to keep the steam temperature down, but even if it is possible to do this for a time, it is well above saturation temperature at the pressure inside the turbine.

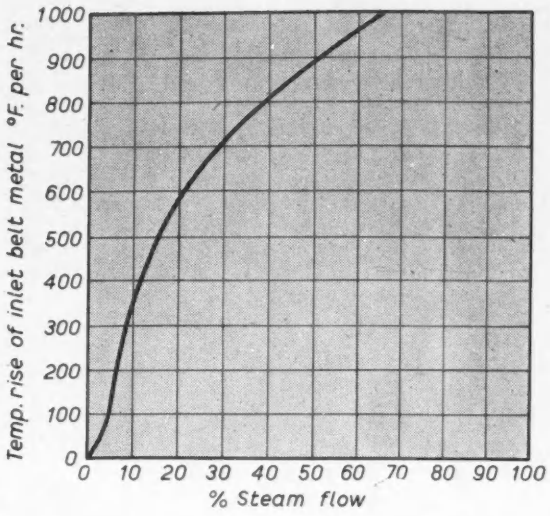
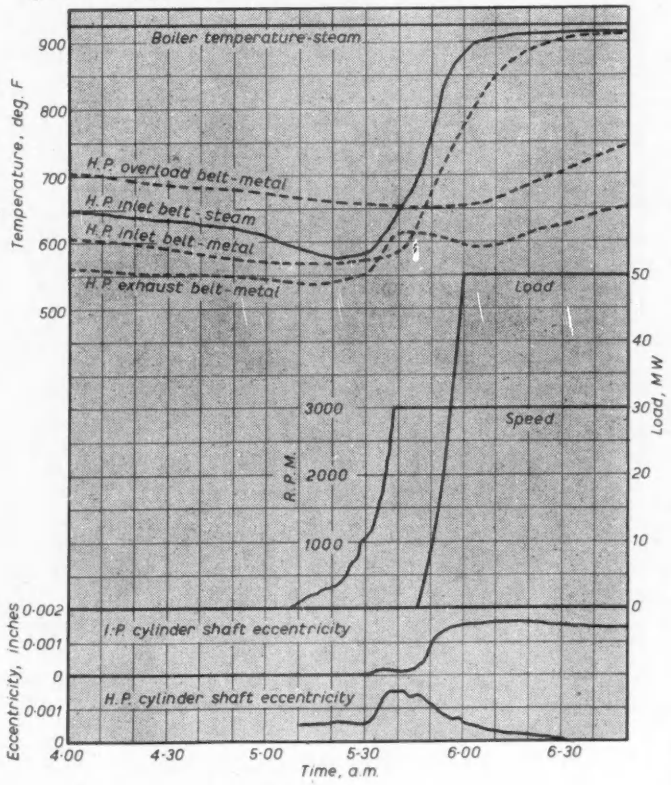


Fig. 7. Observed rate of rise in temperature of metal of turbine-inlet belt related to steam flow, based on temperature difference of 250° F

In normal working, long shut-downs are exceptional, or even if in special circumstances they are unusually frequent, they have already consumed time and have reduced the total number of starts, so that a longer starting time after a long shut-down is not often of major importance.

Fig. 6. Readings of the start of a 50MW turbo-alternator after 6 hours shut down



Rate of Temperature Rise

Fig. 7 shows the observed rate of metal temperature rise related to steam flow, plotted from readings taken at a series of tests on the "guinea pig" machine of Fig. 1. The rate of temperature is plotted for a constant temperature difference of 250° F and is a fair average over a range of metal temperature from 400° F to 700° F. Note the low rate of rise for steam quantities of the order of 2% to 3% of full flow, which are quantities capable of turning the rotor at say 2,000—2,500 r.p.m.

As can be seen, there is very inducement to build up speed and hence steam flow as quickly as the behaviour of the rotor will permit.

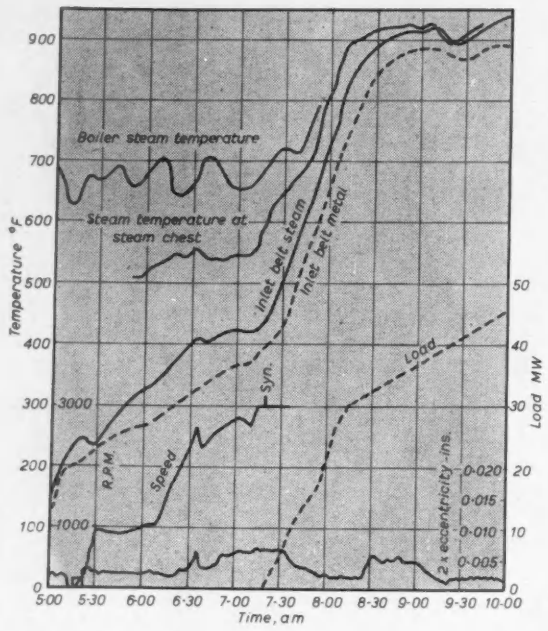


Fig. 8. Readings when starting from cold with controlled steam temperature

Unit Arrangement

Where a unit boiler turbine plant is concerned, there is better prospect of attaining the ideal conditions, whether after a short or long shut-down. Much depends on the boiler characteristics. Whatever these are, there is always the advantage that the boiler will not deliver full temperature steam immediately, and there is likely to be a greater weight of colder piping between boiler and turbine to keep the steam cool longer.

Unit Start from Cold

It will be interesting now to look at records of starts under unit conditions where the boiler characteristics have been controlled as far as possible to suit the turbine. Fig. 8 shows a start from cold. This turbine had been shut down over the week-end, and in consequence, was not completely cold. Had it been so, it would have been advisable to allow a period of initial soaking, possibly measured in hours, to ensure that all parts were drying out and expanding freely and moving towards their working position before embarking on the starting sequence proper. During this period it would be advantageous to have high steam temperature, because the quantity must necessarily be small, but this is not usually possible.

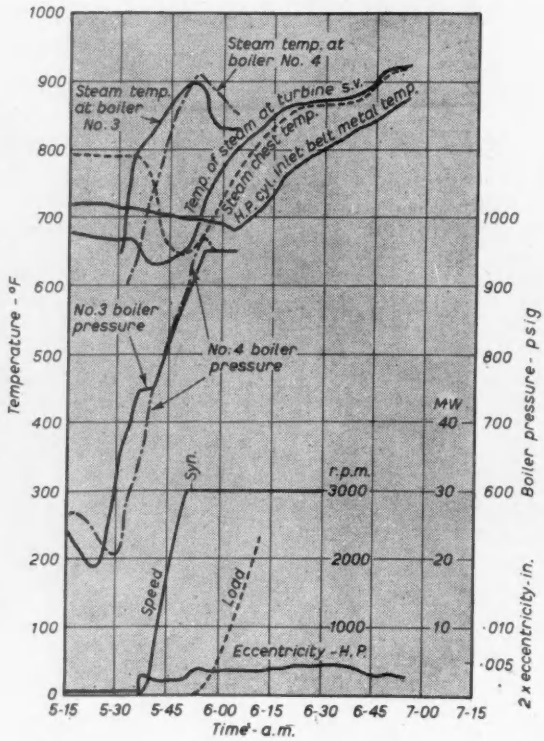
However, assume that the warmed up condition has been reached as at the start on Fig. 8. Thereafter speed was raised to 1,000 r.p.m. in half an hour, and held there for another half hour. Speed was gradually built up to about 2,000 r.p.m. in the next half hour, at about which time (after 1½ hours) the difference in temperature between the steam at inlet to steam chest, and the turbine-inlet belt metal temperature, was approaching the ideal value. It looks as though this knowledge encouraged a somewhat premature increase in speed, provoking a rapid increase in h.p. rotor eccentricity. Speed was promptly dropped, with the desired effect on eccentricity. Satisfactory control thus established, speed was again increased, and although eccentricity again increased, it was known to be under control, and so speed was held. It remained at a tolerable value, allowing the machine to be synchronised about 2¼ hours after the start of rolling. Note that the eccentricity shown on this figure is the actual turbovisory reading, which is twice the radius of eccentricity. After synchronising, load was applied, and from then onwards the gap between inlet steam temperature and inlet belt metal temperature gradually decreased, followed by the expected fall in rotor eccentricity. There is a rise in eccentricity later, probably due to reaction from the i.p. rotor which would then be heating rapidly. No attempt was made to break records in this start. The curves are shown as an example of a controlled run-up.

Unit Start after 6 hr. Shut-down

Fig. 9 shows a start after 6-hour shut-down. Up to 5.20 a.m. normal cooling was in progress with turbine barring. About that time the boilers were lit. At 5.37 the turbine started rolling, and at 5.50, i.e. 13 minutes later, was on full speed. It was then synchronised and loading started. The loading rate of 1½ MW/min was mainly determined by the load available.

This record shows a number of interesting features. First, the temperature differences and eccentricities throughout were such that the run-up was safe and smooth. Second, no prior heating of the boiler-turbine piping system took place. This caused the temperature in the turbine steam chest to drop rapidly, and fall below the turbine inlet belt metal temperature by about 50° F. Full speed no-load steam quantity reversed the downward trend. No ill effects of this negative temperature difference were, or can be, discerned. Third, the turbine was on half load, at least, while the incoming steam temperature was still below the normal working temperature. Considered from

Fig. 9. Readings on a run to speed after 6 hour shut-down



the point of view of exhaust wetness, this is not, perhaps, a situation to be encouraged excessively. It would be preferable to set a limit based on say not more than half load until substantially full temperature had been attained. Fourth, the boiler pressure did not reach the normal working value until the turbine was on speed. There is no objection to this from the turbine point of view.

Differential Expansion

In none of these starts were there any difficulty due to differential expansion between cylinder and rotor. Differential expansion must be watched and in some designs it might set a limit to the rate of heating rather than rotor vibrations. It is easily kept under observation and presents no obscure problems. Nevertheless, differential expansions may require special attention on shutting down, because there is less clearance for relative contraction of the rotor than for relative expansion, and the conditions may be such that the rotor is cooled more rapidly than the cylinder. This would occur, for instance, if cold air were drawn in at the glands and swept over the rotor. However, the control of these matters is well understood.

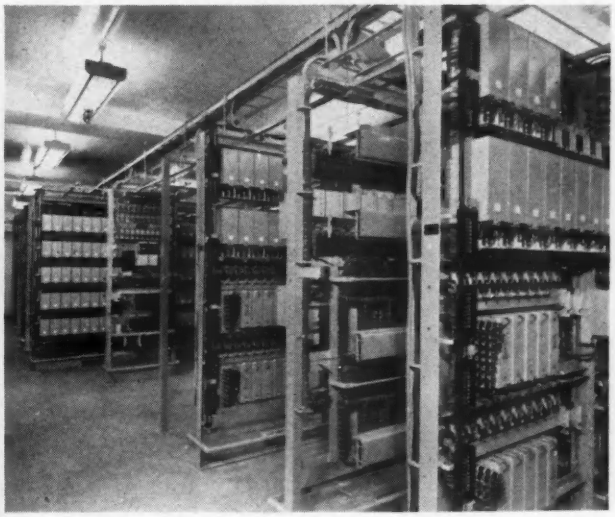
Conclusion

Summarising, then, the process of starting is the process of heating with rotor vibration as the guiding criterion. The factors concerned are variable from machine to machine, and their effects may be cumulative or they may tend to cancel each other out. A new machine should therefore be handled with caution until the rate of heating that particular machine will accept has been established. Usually a machine becomes more easily handled as it settles down, and is better understood by those who operate it. When everything has been done to raise the general level of smooth and flexible operation, by design, skilled manufacture, accurate erection on good foundations, etc., there remains finally experience of a particular machine itself. In making the best of a machine, there is in the end no substitute for such experience.

Much of the information in this article has been obtained through facilities provided by the superintendents and staffs of B.E.A. power stations, and the author wishes to make acknowledgments to them, and also to Mr Norman Elce, Director and Chief Mechanical Engineer, of Metropolitan-Vickers Electrical Co., Ltd., for permission to publish the material.

B.O.A.C.'s New Telephone Installation

EQUIVALENT in size to that required for a small town, the new telephone installation at the B.O.A.C. Headquarters at London Airport has been specially designed to provide the highly flexible communications service required by an air transport organisation of this size. Known as the P.A.B.X. No. 3, and manufactured and installed by the Automatic Telephone and Electric Co., Ltd., the exchange caters at present for 1,300 extensions, whilst space is available to extend up to 2,000 if necessary. Having 95 exchange lines, and 60 private wires, it provides a number of special facilities to the user. Of these, the most important is "hold for enquiry," enabling a receiver to hold an incoming call, and, at the same time on the same telephone, make a further call to either an external or internal line, when the latter has been completed, the original call is restored by merely pressing a button. A further feature is an operator recall button fitted on the telephone, whilst a facility allows outgoing exchange calls up to a call fee value of sixpence to be made from all extensions, relieving operators of much traffic.



Left, the external appearance of B.O.A.C.'s new telephone switch board, fully staffed, whilst the relay racks above indicate the engineering work involved

Lighting and the Supply Industry

HOW far are the advantages offered by modern lighting taken up to the full? This essentially was the question posed by Mr E. C. Lennox, M.I.E.E., F.I.E.S. (manager, Weir Sub-Area, North Eastern Electricity Board), in his Inaugural Address as President of the Illuminating Engineering Society, presented last Tuesday at the Royal Institution. His answer expressed anything but satisfaction with the present position and on the Electricity Supply Industry, he felt, must fall some of the blame.

In much of his address he reviewed the development of the supply industry, particularly in relation to lighting and the improvement in load factor. Whereas in 1893 the lighting value received for one penny was only 440 lumen hours, by 1939 it had risen to 5,500 lumen hours, and is now 23,000 lumen hours. Yet only 22% of the total consumption of electricity, he estimated, was being used for lighting, bringing a revenue of £104m (36% of the total), a position he regarded as far from satisfactory. In the domestic field alone, only some 10% of the 12½ million homes now wired can be considered well lighted—an indication that the simplicity of electric lighting is a mixed blessing. Even today, too small a percentage of new homes and existing houses being wired for the first time are having electrical installations provided in accordance with the approved recommendations. Lighting in rooms still relies on the conventional single pendant fitting whilst the great variety of decorative lighting effects and the potentialities of fluorescent lighting are all submerged in an all embracing indifference.

E. C. Lennox, M.I.E.E., F.I.E.S.

Not only has there been little advance in the wattage of lamps used (60 W is usual for living rooms), but the amount spent by the weekly wage earner in lamps and electricity for lighting has remained practically the same since 1910. Yet there is no service such persons can purchase for their homes of better value than to double the illumination at a total increase of no more than ½d. for every £1 of wages. At the same time the sales assistants in service centres now no longer look upon the electric lamp as an important sale, which is a clear indication of the need for a revival of the prewar energy devoted to bringing the advantages of better lighting to the small consumer. The domestic field, however, was not singled out, for considerable room for improvement was seen in the industrial field (with the suggestion that Boards, or contractors, might also undertake the maintenance of large installations) whilst architecture, generally, had not yet exploited the freedom given by the fluorescent lamp. The traditional architectural view of windows as inlets for daylight and as a means of minimising the use of artificial lighting must give way sooner or later to a more rational viewpoint.

Window Display Lighting

M. Chappat delivers his paper during the special lighting session. The display seen demonstrated the use of spotlights and fluorescent lighting in shop windows

LIGHTING as an aid to effective window display has interested shopkeepers for many years and with increasing varieties of fittings available, the technique of obtaining the best results has been highly developed. Such is the importance of this subject, however, that a special session was devoted to it in this year's National Display Convention which, although primarily a European affair, attracted delegates from as far away as Australia and the United States.

The E.L.M.A. Lighting Service Bureau was made available for the session during which one of the main items was a paper on shop-window lighting technique presented, and read in English by the author, M. Jean Chappat, of the "Compagnie des Lampes." Little fundamental difference between lighting techniques in the two capitals exists, and the use of filament lamps to add highlights and shadows to a fluorescent installation is almost standard practice in Paris. M. Chappat made this point in his paper clear since his talk was illustrated by slides of some of the latest French installations, showing various lighting arrangements.

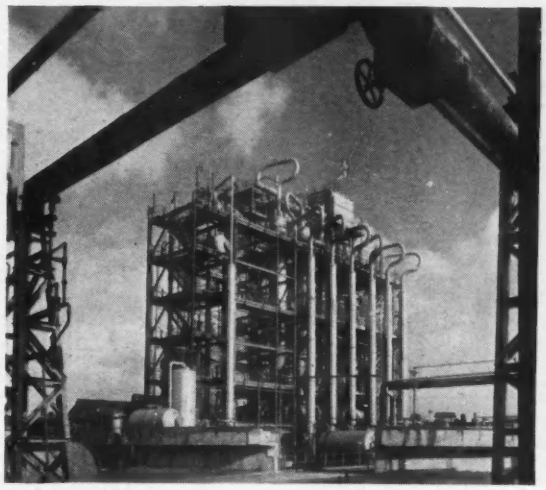
The importance of flexibility was stressed in the paper and later illustrated by three demonstration shop windows provided by the Bureau.

Following a forum during which the paper and other aspects of lighting were discussed, Mr R. L. C. Tate, the Bureau shop lighting specialist, showed a variety of specially illuminated features for incorporating in window displays.

Meanwhile at the Old Horticultural Hall six windows were dressed by leading display specialists from Sweden, Switzerland, Germany, Italy, France and Gt. Britain, each being lighted to suit the individual display. Lamps and equipment were provided by E.L.M.A. members and under the direction of Mr Tate, the Bureau staff endeavoured to produce the results required. A wide variety of requirements were met since both fluorescent and spotlighting, and lighting from above, below, and from both sides were specified. Specialists later expressed their approval.

A question forum wound up the convention.

Silicone Production in Great Britain



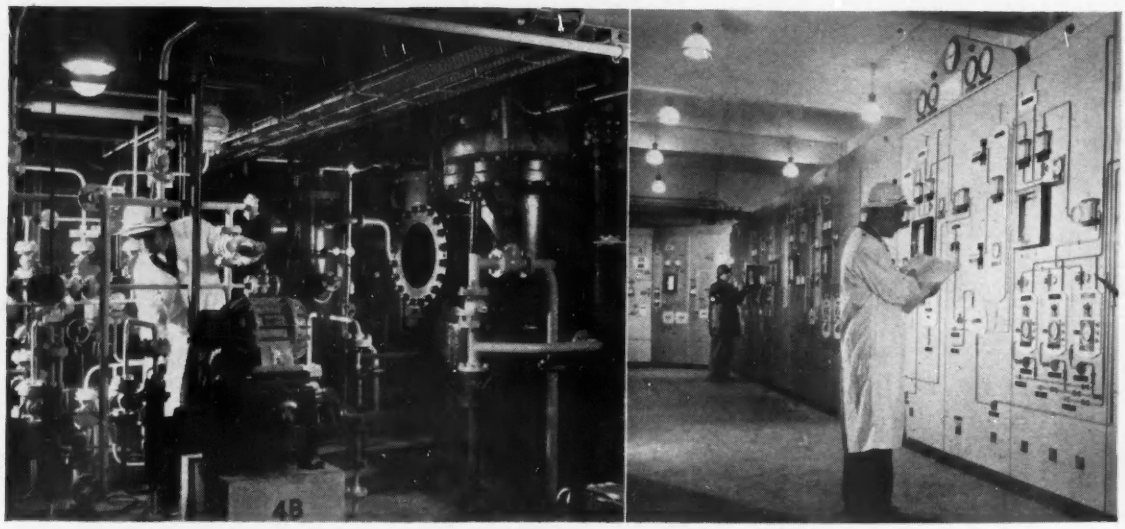
New plant in South Wales now in full scale production

UNTIL recently supplies of silicones necessary to meet rapidly expanding demands from all sections of British industry could only be obtained from the United States but with the commencement of full-scale operation at the new Albright and Wilson Ltd. plant at Barry, South Wales, this country will be rendered increasingly independent of outside sources of this valuable material. To mark this stage in the growth of the silicone industry, the new factory was shown last week to Press representatives and opportunity was taken to inspect processes involved in producing a material which has already made a considerable impact on the electrical industry.

Silicone manufacture involves three basic processes—the production of chlorosilanes, fractional distillation of these materials, and finally hydrolysis of the chlorosilanes to produce silicones. Chlorosilanes are produced by two methods, the "Grignard" process, and the "direct" method. In the former, high purity silicon is made to react with chlorine at about 1,000° C to produce silicon tetrachloride which then undergoes a series of reactions with organic chlorides, in the presence of magnesium metal in ether, produce a mixture of chlorosilanes. By the alternative method, vapourised organic chlorides are passed over silicon at approximately 300° C, in the presence of copper or silver as catalysts, and react directly to produce chlorosilanes.

In both processes, mixtures of mono, di, and tri- substituted chlorosilanes are formed. Each group is the basis of a particular type of silicone, resins being derived from the former, and fluids and elastomers from di-substituted chlorosilanes, whilst the latter are the basis of the dimer, the lowest viscosity silicone fluid. Separation of these three broad groups is undertaken by fractional distillation, requiring careful control due to the closeness of the boiling points of each chlorosilane. Each separate chlorosilane then undergoes hydrolysis, by reacting them with water, the resulting products condensing as silicones. By varying the initial proportions of chlorosilanes the actual chemical composition of the silicone may be varied, thus providing the means of obtaining a wide diversity of end products.

The distillation unit in which fractional distillation of the chlorosilanes takes place is seen at the top of the page. Below is a view of part of the chlorosilane plant indicating the general type of electrical plant in use. The control room shows part of the mimic control panel for the distillation plant and is one of the largest of its kind in Europe



The plant was designed by the company's Central Engineering Department, working from drawings supplied by the Dow Corning Corporation, the American firm which originated commercial production of silicones, and for whom Albright and Wilson Ltd. acted as British Agents, establishing Midland Silicones Ltd. as a marketing organisation. An extensive electrical installation is involved, with the wiring, switchgear and lighting fittings on the actual chemical plants having flameproof enclosures in view of the high inflammability of chlorosilane and other materials involved. For the flameproof installation, m.i.c.c. cables are employed, special care having to be taken to prevent corrosion of the copper sheathing. In non-hazardous areas, p.i.l.c. wire armoured cables (part of the installation existing before it was taken over for silicone production) supply all power and main lighting supplies, final sub-circuits being carried out in conduit.

Nearly all electrical power takes the form of flameproof motors employed in driving pumps. Motor distribution switch and starter gear is housed in separate sub-main distribution switch rooms, thus avoiding the expense of flameproof enclosures for this equipment. Motors are started and stopped from remote control flameproof push-button units in their immediate neighbourhood. Only in one instance is electrical heating employed—for kettles in which the hydrolysed chlorosilanes are stripped of the small proportion left unhydrolysed. In these units, the 30 kW heating elements are mounted round the outside of special steel linings, whilst enclosed, of course, in a flameproof outer covering.

For emergencies, two manually started diesel-driven generators are installed. These provide a supply to a motor dealing with the sludge filtered off from the output of the Grignard process, to ensure that, should the main supply fail, this sludge is kept in a mobile condition to facilitate its removal. A main supply is taken at 11 kV, and transformed down to 440 V at the works' own sub-station, where some 6 MVA of transforming plant is installed. From here a radial network of p.i.l.c. cables supplies the five sub-main distribution points.

Reconditioning Domestic Appliances

RECENTLY a new service repair shop was opened in Brighton to deal with the reconditioning and normal servicing of domestic appliances covered by the South Eastern Electricity Board's hiring scheme. The new workshop, which is spread over four floors of a building in Spring Gardens, has been adapted specially to deal with wash boilers, cookers, water-heaters, kettles and other equipment returned for reconditioning.

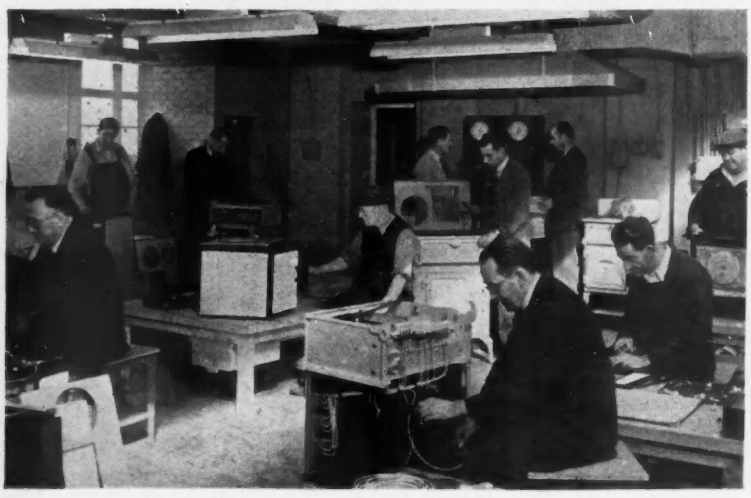
In general, cookers are serviced on the ground floor, heaters on the first, and refrigerators and small appliances on the second floor. All floors are connected by two lifts, one power lift carrying up to 5 cwt, the other, hand operated, is used for transporting goods from the stores.

When received all equipment is broken down into component parts and each part sent to a special section for reconditioning. The paint shop illustrates a novel use for old switchgear cubicles, which the staff has adapted to make two thermostatically controlled stoving ovens. G.E.C. supplied the elements. In addition, there are two spray-booths which are equipped with a centrally-placed evacuating fan to exhaust the fumes away from the operator. Fluorescent tubes have been installed in the booths to give adequate lighting. In general the level of lighting throughout the whole shops is adequate and fluorescent tubes in the main are being used.

Plating baths for nickel and copper are used mainly for kettles while the tinning of the insides of wash-boilers and kettles is carried out by electro-deposition. Wherever possible, the Board have used their own resources and this is particularly noticeable with the various testing facilities that are available. Since part of the Brighton network is still direct current, testing facilities have had to be provided for d.c. equipment, and on each floor a d.c. ring is available for the supply to test lamps. In the heater workshop, which deals with both sink and bath types, testing rigs have been provided for each type to allow up to six at a time to be checked for correct operation of thermostats.

Electrical power is carried through 4 in. trunking to each floor from which all points are fed through 3 in. trunking. For easy servicing, d.c. cables are distinguished from a.c. since p.v.c. is used against the latter's v.r.i.

In the foreground cookers are being assembled whilst at the back the testing panel is just visible



Since new equipment is no longer hired, the demand for reconditioned appliances remains high and the workshop expect to turn out between 30 and 40 cookers per week, to be sent to the various showrooms in the Sub-Area for hiring purposes. Other equipment is reconditioned for resale. The quality of finish of products from the workshop is of a high order and general standard of workmanship is such that the equipment may be regarded as being in "as-new" condition when despatched. The workshop was officially opened by Mr Norman Elliott, Chairman of the Board, who was introduced by Mr A. M. Harker, Manager, Brighton and Hove District, who pointed out that the Brighton Corporation began hiring out domestic appliances as long ago as 1912.

Domestic Appliance Production in the U.S.

NEW REPORT ON IRONS, HOTPLATES AND SPACE HEATERS

LATEST in the series of reports, compiled by the U.S. Bureau of Labor Statistics, Washington, D.C., on productivity and factory performance is one on the manufacture of three types of domestic appliances—irons, hotplates and space heaters.

The report is divided into three chapters, the first of which gives a general survey of the scene. The second contains detailed case studies of each plant and is thus of primary value to the plant superintendent or the production engineer, while the last chapter gives a brief discussion of workers' earnings, the benefits workers receive from increased productivity and the implications of trade unions.

Appliances Considered

In the United States, a national consumers' advisory publication regards any electric iron without a thermostat as in the "unacceptable" category because of the safety factor alone. The firms making irons, therefore, all had a thermostatically-controlled product. In order to enable comparisons to be made, the specification for the irons under consideration was laid down as 100-120 V, 1,000 or 1,100 W, 2½ to 4½ lb in weight, and cast steel or cast aluminium sole plate. The hot plate specification was similarly restricted to 110-120 V, 1,650 W (a.c. or d.c.), 8 to 13 lb. Dimensions to be approximately 18 by 10 by 5 in. with one or two single-heat or multi-heat plates. Finish could be painted or enamelled finish, or a combination of painted, enamelled and plated finishes. The space heaters concerned were of the fan type; 115 V; 1,200 to 1,600 W. 60 c/s, a.c. only, with various types of finishes.

TABLE 1. MAN-HOURS REQUIRED PER 100 UNITS FOR PRODUCTION OF ELECTRICALLY OPERATED, AUTOMATIC IRONS, HOT PLATES AND SPACE HEATERS; AND RELATED DATA. TEN SELECTED PLANTS, U.S.A. 1952.

Plant	Man hours per 100 units			Per cent of indirect to total	Number of production workers
	Total	Direct	Indirect		
Automatic irons:					
A	75·71	49·55	26·16	34·6	200–500
B	70·09	54·86	15·23	21·7	100–150
C	120·19	80·13	40·06	33·3	100–150
D	40·60	32·69	7·91	19·5	50–100
Hot plates:					
E	80·21	40·11	40·10	50·0	500–1,000
F	21·04	16·22	4·82	22·9	50–100
G	124·43	59·95	64·48	51·8	500–1,000
H	36·45	25·10	11·35	31·1	50–100
Space heaters:					
G	107·70	53·00	54·70	50·8	500–1,000
H	60·68	50·34	10·34	17·0	50–100
I	78·75	69·15	9·60	12·2	10–50
J	54·47	44·09	10·38	19·1	500–1,000

Ten firms were investigated of which two made both space heaters and hot plates. The price (retail) of the finished product showed an overall variation for irons (four separate firms) from $7·50 to $15; in space heaters (four firms) from $12·50 to $25 and in hot plates (four firms two common to space heaters) from $5 to $12·50. The wide range in price for each type of appliance was due to differences in design and finish.

Type of Plant

The ten plants included in the study differed widely in size, number of employees, degree of mechanisation and operating practices. The buildings ranged in size from 10,000 to 300,000 sq ft and from 1 to 5 storeys. Fabricating departments of all reporting plants were equipped with a variety of punch-presses for sheet metal stamping. Materials handling ranged from highly integrated mechanised conveyor systems, to one plant in which all supplies, parts, and finished units were moved by hand. Automatic plating systems were used by two of the iron-manufacturing firms. Three of the firms made their own coil-winding machinery for the elements in the various appliances, whereas two purchased automatic winding machines. One plant used a lathe with a special fixture attached to perform the job, and one wound elements by hand.

All the plants participating in the study were multi-product plants. The other products ranged from one or two items in the smaller units up to a dozen or so differing electrical and mechanical items in the larger firms.

Thorough checking of the electrical functioning of the appliances was carried out at all plants during final inspection, and many of them used a spot check or a sampling system for parts in the manufacturing process prior to final assembly. At one plant (Plant "A" in Table 1) inspection operations comprised 16% of the total direct man hours. Two firms reported that their inspection process disclosed faults which required reworking of about 5% of the total production.

The four manufacturers of electric irons, three of the producers of space heaters and two of the plants making hot plates, reported peak production during the autumn, although four of the ten co-operating plants also reported a considerable upswing in the spring months.

Labour

Although the seasonal pattern tended to create an unemployment problem, most of the reporting plants were able to shift their workers to the output of other items during the months of lower activity.

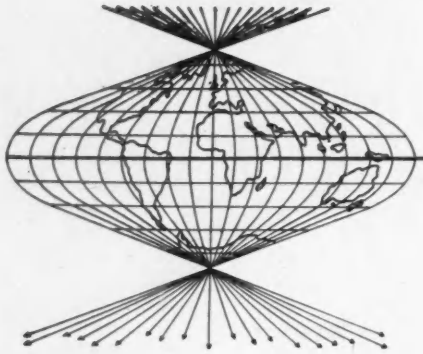
Seven of the firms paid direct labour on an incentive basis, four of them using the straight "piecework" basis. Of six firms reporting information on "fringe benefits," none reported a sick-leave-with-pay arrangement, although three reported employee hospitalisation insurance programmes. Five of the firms provided both paid vacations and holidays, and four, where second and third shift working was in operation, paid a shift differential.

The four larger concerns (A, E., G. and J—see Table 1) had production engineering and product research departments ranging in size from 7 to 16 staff members. In four other plants this function was performed by the production manager or plant superintendent. One plant obtained its professional engineering services from an outside firm.

The Report gives a general review of the processes involved in the manufacture of the items, and notes that the total man-hours per 100 units varied widely among the ten reporting establishments. Man-hours per 100 for automatic electric irons ranged from 41 to 120; for hot plates from 21 to 124; and for space heaters from 54 to 108.

Manufacturing processes are tabulated in detail for all the firms in the most comprehensive manner, and general data on the sales and retail value of sales of the appliances concerned in the U.S. are given.

Copies of the report "U.S. Case Study Data on Productivity and Factory Performance—Irons, Hot Plates and Space Heaters," may be obtained from the British Institute of Management, Management House, 8 Hill Street, London, W.1. Price 7s. 6d.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

N.B. Committee

In New Brunswick, a four-man Interdepartmental Committee on electric power and mining has been set up. Members of the committee are Prof W. Y. Smith, the Provincial Government's recently-appointed economic advisor, Dr H. J. Rowley, chairman N. B. Resources Development Board, C. S. Clements, Mines Branch director, and R. E. Tweeddale, development engineer to the New Brunswick Electric Power Commission. The committee is to study the general problem of the relationship of the availability and price of electric power to the development of the province's mining industries.

More Power for B.C.

The 20,000 kW hydro-electric project of the British Columbia Power Commission on the Pantledge River is expected to be completed next spring, it has been announced. The new plant will help to supplement the power produced by the hard-pressed Vancouver Island system, on which the demand is rapidly approaching capacity.

C.E.M.A. Meeting

Domestic production by Canadian electrical manufacturers increased by 16·6% last year to a total of $974 millions in value, Mr O. W. Titus, president of the Canadian Electrical Manufacturers' Association, stated at the annual meeting of the Association recently. But he emphasised that the average profit margin continued to decline. He also told delegates that imports of electrical products jumped 38% to $269 millions last year. Imports of U.S. refrigerators and freezers were 78% of the total Canadian production. In his view that almost phenomenal increase in imports further emphasised the need for reasonable and stable tariff protection. A large part of the import increase was attributable to imports of heavy electrical apparatus and equipment from low-wage-rate areas in the United Kingdom and Europe, he added.

Water—at a Price

The British Columbia Lands Minister, Mr R. Sommers, has announced that an agreement has been reached for a survey of a proposed $25 millions dam on the Columbia River. The Kaiser Aluminium and Chemical Corporation is to be permitted to carry out engineering and geological investigations of proposed sites for a large storage dam at Castlegar Narrows at the foot of Arrow lakes, some 300 miles east of Vancouver. Behind the dam would be a reservoir with a capacity of about 3 million acre feet. No power would be generated at the dam, but water would be released for power generation in the United States. Mr Sommers has said that the revenue would be far greater than has accrued from comparable water power development in British Columbia. He estimated that not less than $1 million in fees and taxes would be paid to B.C. annually.

AUSTRALIA

Loans for power in W.A.

The programme of the State Electricity Commission of Western Australia for the 1954-55 year includes the raising of public loans of £2,960,000. The first loan for the year of £1,500,000 closed recently fully subscribed. This loan was the fifth public loan raised by the Commission since it was given power to raise money on the open market. The total raised to date is over £6,000,000. The works programme for 1954-55 includes the completion of the 100,000 kW station at South Fremantle and the preliminary work on the foundations and boiler structure on the new 90,000 kW station being erected at Bunbury. In addition, additional boiler plant and a new 30,000 kW turbo-alternator are being erected at the East Perth power station.

The demand for power in Western Australia has increased enormously in recent years due to the increased industrialisation of the State, which includes a new oil refinery costing £44,000,000, a new cement works and a steel rolling mill. In addition, the Commission has extended transmission lines to country areas where it has commenced a programme of providing electricity to farmers. The Commission's present programme will mean that the installed capacity of the steam generating plant operated by the Commission will have increased from 58,000 kW in 1950 to 260,000 kW by 1960.

Funds for Tasmania

The installed capacity of the Tasmanian hydro-electric system is now 433,000 h.p. compared with 328,000 h.p. this time last year, but the demand for power is increasing at the rate of 12% a year. To meet the demand it was essential for schemes under way to be completed. This was the essence of a statement by the Premier, Mr Cosgrove, in the House of Assembly, when speaking on the second reading of the Public Works Bill which provides for an expenditure of £7,500,000 on hydro-electric construction for the current financial year. Mr Cosgrove said the installed capacity in 1949 was 255,000 h.p. In five years the capacity had increased by 70%, while the increase in the past 12 months had been 25%. The peak loading to date this year had been 367,000 h.p. In addition the commission had major commitments to meet during the next two years, including power for the production of aluminium and ammonium sulphate. The number of consumers was more than 97,000. To meet the expected loading, without restrictions, the Commission must be able to fulfil its planned programme of works, including the Trevallyn, Lake Echo, and Wayatinah power developments. Developments included in the present programme would only cope with the power position by normal growth, without further commitments, until 1961 or 1962. By then a further major development must be completed.

EUROPE

Power Export

It has been agreed between the Trondheim and Stockholm municipalities that the contract for the export of electric power to the latter from Trondelag, which was subject to the approval of the Storting, shall be left in abeyance for the time being pending further discussion by the two governments concerning the whole proposal for joint Scandinavian development of Norway's hydro-electric resources.

New Station for Rotterdam

The first pile was driven recently for a large power station to be erected on the west side of the Rotterdam Wall Dock. This new station will eventually

have a total capacity of between 500,000 kW and 600,000 kW, and will then be the largest Dutch electric power station.

Greek H.E. Contract

Professor G. Pezopoulos, director general of the Public Power Corporation, has announced the signature of a preliminary contract between the Power Corporation and the French firms Omnium Lyonnais and Cotesi for the construction of the Megdova hydro-electric plant of 84,000 kW. This preliminary contract was drafted and signed on the basis of the more general agreement concluded between the Greek Government and these two French companies in Nov., 1953, and which had been amended last July. The final contract, which is now being discussed in detail will be drafted and signed before the end of the year. In accordance with the preliminary contract, preparatory work will start before the end of September. The two French firms will also undertake construction of the main parts of the Megdova irrigation project. Prof Pezopoulos added that the entire Megdova project is expected to cost approximately $12-13 millions, and should start functioning by 1959. The work will be effected with the help of credits granted by France, and it is foreseen that $6·5 millions from these credits will be spent on the purchase of machinery and on services.

EGYPT

A Last Resort?

Dissatisfied with the present system of illumination generally in use in the Ras el Bar summer resort, the Egyptian Minister of Municipal and Rural affairs has applied to the National Production Council for a credit of £E90,000 to be added to the £E160,000 already opened by the Ministry, to enable a supply of electricity to be more generally available throughout the resort. It was stated that certain individuals who have the concession for supplying electricity to the huts were demanding "fantastic" prices.

NEW ZEALAND

Cash for Expansion

The executive officers of the Otago Electric Power Board, New Zealand, are to prepare a report for the raising of a £60,000 loan for substations and transformers. The engineer, Mr R. Hide, has reported that loan money was fast running out due to the load increasing rapidly and additional transformers being required. The result was that some of the £95,000 loan expenditure could not be met. The Balclutha-Owaka line was considered the most urgent due to overloading, while at Waikouaiti larger transformers were required. On the Lawrence-Beaumont line voltage was very poor and required attention. It was reported that in under two years the board has provided a distribution network over 400 sq miles of its extensive area, but it was expected that within the next two years the last major work in the northern district of the area would be begun.

No Reductions Yet

Although the New Zealand State Hydro-Electric Department made a net profit of £1,000,000 last year, there was every chance of a loss on this year's operations, said the Minister in charge of the department, Mr W. S. Goosman when replying in the New Zealand House of Representatives to Opposition charges that the price to the consumer of electricity was too high. The Minister said that prices would come under review when the supply authorities met the department at the end of next year. If the department was in credit, prices would go down, but if there was a deficit, recovery would have to be made from suppliers. Last year's operations, the first under the new agreement with the supply authorities, were successful chiefly because conditions were good. Rain fell at critical times, and there was no need to use subsidiary services. This year, however, water storage was not as great, and coal and oil burners would have to be used to augment supplies.

SOUTH AMERICA

Plans for Development

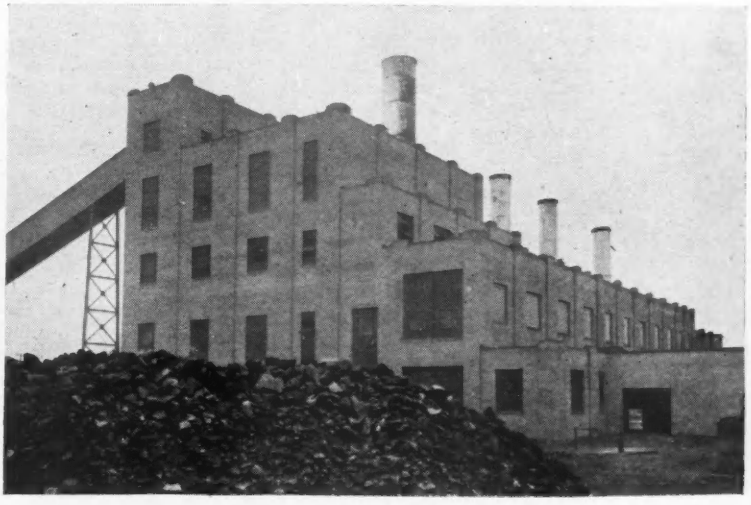
In Colombia, the Electrical Development Institute has been preparing plans, based on reports of American and French engineers. They are reported to provide for the expenditure of Ps. 88 millions by 1965 for Caldas, Ps. 115 millions for Bogota, and Ps. 225 millions for Medellin. It is also stated that the Coffee Bank is to lend the Department of Antioquia U.S. $1·7 millions of which U.S. $9 millions will be used to finance the rural municipalities' hydro-electric schemes. The Departmental Government is considering organising an electricity corporation to take over and co-ordinate these schemes, another of which, on the River Aurra, has recently been announced as being under preliminary consideration. A Ps. 2 millions loan negotiated by the Government of Caldas is to be used for the improvement of Armenia's electricity distribution system. The Manizales firm, Electro Colombia has secured the contract for the design of a hydro-electric plant on the River Supia and transmission lines to neighbouring towns. The U.S. firm of Parson and Whittemore is studying the possible financing of electricity and other schemes in the Department of Atlantico.

On the industrial side, there is news that Coletejer, the largest cotton manufacturers in Colombia, are contemplating doubling the current capacity of its present thermal power plant of 8,000 kW.

FAR EAST

Expansion in Burma

Amplification of the rural electrification plans of the Electricity Supply Board of Burma, was given by the chairman U Ba Sein, recently. He explained that the work would be undertaken in two stages. Initially diesel generators would be installed, and later, hydro-electric schemes would be developed. It is hoped that by the end of this year 177 towns would have electric light, and by the end of 1955 up to 250 towns.



The Saskatchewan Power Corporation recently commissioned a 20,000 kW extension to their Estevan power station which serves the entire eastern portion of their transmission system. The extension has raised the installed capacity of the station to 42,750 kW. Equipment added to the station included a C. A. Parsons 20,000 kW turbo-generator and a Foster Wheeler 200,000 lb/hr return grate spreader stoker fired steam generator. Steam conditions are 400 lb/sq in. and 750°F. The station is located in the extensive lignite coal field of south-eastern Saskatchewan, and makes use of ½ in. x 0 screenings from the local coal mines. Coal is delivered to the station by motor trucks. It will be recalled than an order was recently placed with the Metropolitan-Vickers Electrical Co., Ltd., for a 30,000 kW turbo-generator which will raise the capacity of the Estevan station to 72,750 kW by 1957

Personalities

IN THE INDUSTRY

The Midland Electric Manufacturing Co., Ltd., have announced that **Mr A. Wynn** has been appointed chairman and joint managing director of the company. Mr Wynn succeeds Mr W. L. Barber, whose untimely death occurred last Aug. He joined M.E.M. in 1923, became general manager, joint managing director in 1940 and managing director in January 1945. **Mr W. J. Barber,** previously deputy managing director has now been appointed joint managing director.

Because of heavy business commitments **Sir Kenneth Hague,** deputy chairman and managing director of Babcock and Wilcox Ltd., has had to resign the chairmanship of Edwin Danks and Co. (Oldbury) Ltd., an associated company. **General Sir Kenneth Crawford,** K.C.B., M.C., has been appointed a director of Edwin Danks and chairman in his place.

Managership of the West Devon district in the S. Western Electricity Board's Devon sub-area changes hands, **Mr S. J. Swain,** ASSOC.I.E.E., taking over from **Mr W. J. Oxenham,** M.I.E.E. The district's new manager joined the electricity supply industry in 1919, serving with the Aldershot and District Power Co. and then with their successors, the Mid-Southern Utility Co. until 1936. Mr Swain remained at Aldershot as senior assistant mains superintendent for the War Dept. He left in 1945 to join the Brixham Gas and Electricity Co. On vesting-day Mr Swain was appointed district senior executive officer and in 1950 became branch manager at Paignton which included his former Brixham territory.

Mr Oxenham's association with the supply industry in Devon and Cornwall goes back to 1906. He began with the Electric Supply Corpn. Ltd. at Exmouth. In 1914 he was appointed engineer and manager of Launceston and District Supply Co., Ltd., but resigned in 1922 to take a similar post with the newly-formed Bideford and District Electric Supply Co., Ltd. Mr Oxenham held that position until nationa...tion, when he became district manager at Bideford for West Devon.

Two appointments to Electricity Consultative Councils were made by the Minister of Fuel and Power last week. **Mrs D. E. L. West,** of Beckenham, Kent, has been appointed as a member of the London Council, and **Clr. Ithel Davies** of Galon Uchaf, Merthyr Tydfil, as a member of the S. Wales Council. **Clr. John R. Martin** of Swansea, has retired from the latter on completion of his term of office.

Chairman of Radiovisor Parent Ltd., **Mr C. R. C. Marlow,** recently returned to this country from a business visit to the U.S.A. and Canada. In Philadelphia he attended the First International Instrument Exposition, and in Montreal he discussed business between his company and an aircraft firm.

Mr K. V. Farmer, vice-president and director of Canadian Ohio Brass Co., is to be the new president of the Canadian electrical manufacturers' association.

Following the appointment of **Mr Brian H. Colquhoun,** B.SC., M.INST.C.E., M.I.STRUCT.E., M.CONS.E., M.E.I.C.(CANADA), M.SOC.C.E.(FRANCE), senior partner of Brian Colquhoun and Partners, consulting engineers, as engineering adviser to the International Bank for Reconstruction and Development (World Bank) for a period of two years on secondment, the firm has taken three of its senior engineers into partnership—namely: **Mr W. J. Llewellyn,** M.INST.C.E., A.M.I.W.E., A.M.A.SC.E.(U.S.A.), F.G.S.; **Mr P. Mason,** B.SC., A.M.INST.C.E., A.M.I.STRUCT.E.; and **Mr A. U. Shiach,** A.M.INST.C.E., M.E.I.C. (CANADA).

Three appointments were announced last week by the S. Wales Electricity Board. **Mr A. Jolley,** district engineer, moves from the Haverfordwest, Narbeth, Milford Haven and Fishguard districts, to take over the Tenby district, all in the Board's Western sub-area. He succeeds **Mr D. H. John** at Tenby, who is retiring shorty after 23 years' service with the supply industry. Mr Jolley's successor is **Mr G. V. Vaughan,** ASSOC.I.E.E., formerly first assistant district engineer.

Mr T. Litherland, GRAD.I.E.E., formerly with the N. Western Electricity Board, becomes first assistant district engineer at Cardiff East. He succeeds **Mr J. A. Robinson,** A.M.I.E.E., who is to take up an appointment with the Yorkshire Board.

Mr W. M. York, executive director, publicity, E. K. Cole Ltd., is now on a tour of U.S.A. and Canada, during which he is making a study of both commercial and colour television.

The retirement was announced last week of **Mr F. R. Unwin,** M.I.E.E., manager of the Instrument and Switchgear Dept. of the General Electric Co., Ltd. He will be succeeded by **Mr J. Lawrence,** who until recently was assistant district manager for the north-west area at the firm's Manchester branch. Mr Unwin has been with the G.E.C. since 1919.

After the 1914-18 hostilities he was attached to the G.E.C.'s Birmingham sales branch as branch engineer, and was appointed assistant manager in 1923. Four years later Mr Unwin became manager of the Irish District, and whilst in that country was chairman of the Irish Centre of the I.E.E. in 1933 and later vice-president of the Belfast Association of Engineers. He was appointed manager of the instrument and switchgear department in Apr. 1945.

Mr Lawrence has been with the company almost as long. Between 1921 and 1930 he was Midland area manager for

Mr F. R. Unwin

Mr J. Lawrence

Mr E. G. Taylor

Mr L. D. Goldsmith

Mr J. A. Walters

Mr H. F. North

Col G. G. Mallinson

Mr A. C. Bryant

Mr F. Coan

Ald A. Sturgess

the Express Lift Co., Ltd. He later transferred to the parent company and was at the Birmingham branch until 1940 when he became assistant district manager for Scotland. He took over a similar post in the north-west district in 1945.

Succeeding Mr Lawrence in that area is **Mr E. G. Taylor,** B.SC.(ENG.), M.I.E.E. Mr Taylor has looked after the G.E.C.'s interests in Liverpool and Manchester since 1922 apart from six years spent at the firm's Swansea Branch. He was a member of the Anglo-American Materials Handling Productivity Team of 1949. He served on the I.E.E. Council from 1941 to 1944, was chairman of the Mersey and N. Wales Centre of the I.E.E. in 1941-42, and a member of the Centre's Committee from 1935-45.

Other appointments announced by the G.E.C. this week concern the managers of the battery works at Witton and of the company's Blackburn branch. **Mr L. D. Goldsmith,** B.SC., A.R.C.S., F.R.I.C., has retired after 39 years with the company and is succeeded by **Mr J. A. Walters,** who was previously manager of the special products department at Head Office. Mr Walters joined the G.E.C. research laboratories in 1928 and ten years later transferred to the then arc lamp and carbon department. He took over as manager of the special products department in 1951. At the time of his retirement, Mr Goldsmith was a director of Parkhall Pottery Ltd. and consultant to the United Lamp Black Works Ltd., both associated concerns. At Blackburn **Mr H. F. North,** formerly branch engineer at Sheffield, takes over the managership at Blackburn from **Mr H. W. Roberts,** A.M.I.E.E., who has retired. Mr North started at Witton in 1923 and was there until 1938. This is not his first visit to Blackburn. He was branch engineer there in 1938 until moving to Sheffield in 1947. Mr Roberts retires after 42 years. He was appointed manager at Blackburn when the branch was opened in 1931.

Mr T. E. Goldup, C.B.E., M.I.E.E., now visiting the U.S.A. to attend a meeting of the International Electrotechnical Commission, is studying the latest electronic developments in America. Mr Goldup is chairman of the I.E.C. Committee which deals with electronic tubes and valves.

After 54 years with the General Electric Co. **Miss Elsie Churchill** has retired. She joined the invoice department of the firm in 1900. On her retirement, Mr T. B. O. Kerr, director and secretary, made a presentation on behalf of her friends and colleagues.

The Minister of Fuel and Power has made a new appointment to the N.E. Electricity Consultative Council. The new member is **Clr. F. Manton** of Middlesbrough.

Col G. G. Mallinson, M.I.E.E., manager of the Newcastle branch of Johnson and Phillips, Ltd., has retired, but he will continue to serve the Company in a consultative capacity. Col Mallinson joined J. and P. in 1925 as branch engineer, and was later appointed a director of the former Westmorland and District Electrical Supply Co. An active member of the I.E.E., he was chairman of the N.E. Centre for 1947-48. Col Mallinson served with distinction in both World Wars and was awarded the Legion of Honour and Croix de Guerre. As branch manager to the company at Newcastle, **Mr A. C. Bryant,** A.M.I.E.E., ASSOC.I.MECH.E., succeeds Col Mallinson. Mr Bryant received his technical training at Faraday House where he was awarded a 1st Class Diploma in Electrical and Mechanical Engineering. He joined Johnson and Phillips in 1936 as a junior engineer in the Contract Department. In 1946 he was transferred to Edinburgh, taking charge of all contract work in Scotland, and he was appointed assistant manager of the Edinburgh branch in 1952.

Mr H. Priest has joined the car radio sales division of E. K. Cole Ltd. as technical representative and will be responsible for liaison with car manufacturers and dealers. He will be based in the Midlands.

After 54 years service with Laurence Scott and Electromotors Ltd., **Mr Frank Coan** has retired. During his lengthy period he held a number of positions on the commercial side. For a considerable time he was personal secretary to Mr W. H. Scott, the founder of the company, and on Mr Scott's death he continued in the same position with Capt G. J. Scott until the death of the latter early in the war. Since then he has been Labour officer and "father" of the apprentices.

Mr B. H. Douthwaite, A.M.I.E.E. has been appointed sales manager of British Physical Laboratories. He will be responsible for sales at home in respect of both the British Physical Laboratories and the Quadrant Meter Co. During the war he was engaged on radar counter measures as a member of the scientific staff of the G.E.C., and has subsequently gained much experience as a technical executive with a number of other firms.

We hear that **Ald Arthur Sturgess,** O.B.E., J.P., part-time member of the East Midlands Electricity Board, is to receive the honorary freedom of Derby. The ceremony is to take place on 21 Oct. Ald Sturgess has been associated with the supply industry for some 25 years now, being chairman of the Derby Corporation Electricity Committee for 18 years prior to nationalisation. He was mayor of Derby in 1927-28 and received the O.B.E. in 1939. Among his varied activities Ald Sturgess was secretary of the Derby district of the A.E.U. for 35 years. He has been a member of the National Joint Council and the National Joint Industrial Council of the Electricity Supply Industry for the past 16 years and has also served on the National Joint Board.

At the annual meeting of the Women's Engineering Society in Birmingham last weekend, **Miss Kathleen M. Cook,** senior vice-president, was elected president.

OBITUARY

Mr James E. Moulton, assistant secretary of Hoover Ltd., died suddenly on 3 Oct., aged 42. Mr Moulton had been with Hoover since 1937 when he took charge of the share transfer department. He was promoted assistant secretary in 1946.

After an illness lasting several months, **Air Chief Marshal Sir Roderic Hill,** K.C.B., M.C., A.F.C., died in London last Wednesday at the age of 60. Almost half of his 32 years in the R.F.C. and R.A.F. had been spent in technical posts. He will be remembered particularly as Rector of the Imperial College of Science and Technology. He assumed that post in 1948 on his retirement from the R.A.F. Sir Roderic was elected vice-chancellor of the University of London last year but resigned in June due to ill-health.

Equipment for Industry

Hydrostatic Dust Collector

A NEW type of dust collector has been added to the range of patent "Multiswirl" models manufactured by DALLOW LAMBERT and CO., LTD., Spalding Rd, Leicester. High efficiency is claimed for this equipment, since it incorporates a hydrostatic cross-tube element, patented by the firm, and scrubs the dust-laden atmosphere in air or water. The unit is suitable for use in chemical industries, foundry work and sanding operations, special safety features are afforded for the handling of explosive dusts. The illustration shows model ME10/9 which is designed as a complete unit, to handle 1,000 cu ft/min. A hand-controlled valve allows for sludge removal on this model.

"Multiswirl" collectors are manufactured in a range of sizes to suit various applications, and have capacities from 200 to 100,000 cu ft/min, the larger sizes being fitted with multiple cross tube elements and automatic sludge disposal. In the case of soluble dusts, where no sludge is formed, it is usual to arrange for continuous or intermittent drainage, either to waste or to a reclamation process.

An example of the ME Series

High-Bay Lighting Unit

OFTEN, although high intensity of illumination from a lamp placed at a low mounting height is desirable, conditions make it either inconvenient or impossible to install at that height. The reasonable alternative in these cases is to install a powerful lamp at a more suitable height, a practice which is, of course, carried out in steel works and heavy engineering shops, having lofty interiors.

A new high-bay lighting unit which has been specially designed to suit characteristics of the latest 1 kW type MB/V mercury discharge lamp is now being manufactured by HOLOPHANE LTD., Elverton St, S.W.1. The unit has a heat-resisting glass reflector sealed in a steel cover, surmounted by a cast aluminium canopy. The robust construction of the lamp unit makes it particularly suitable for use in the arduous conditions to be

The robust construction of this lamp makes it particularly suitable for industrial applications

expected in the situations mentioned above. Four stout metal straps, forming part of the fitting assembly, allow for supplementary strap suspension from the roof structure and for the provision of stirrup-mounting where necessary.

Furnaces by Birlec

WHERE a furnace is required for tempering, hardening, annealing or some other process, according to the metal being treated, the use of a particular type may be difficult to decide. BIRLEC LTD, Tyburn Rd, Erdington, Birmingham, give the answers to many of the problems which face engineers, in selecting the most suitable type, in three leaflets which they have just published. These cover the standard V.F.C. range of furnaces, low frequency induction melting and "Ajax" induction melting furnaces.

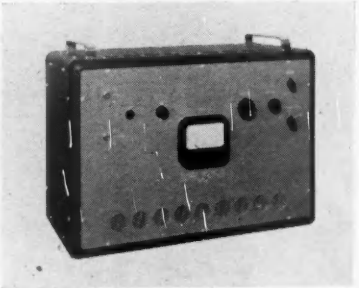
Mainly for tool steels, the (V.F.C.) vertical forced air circulation furnaces are suitable for heat treatment operations up to 700°C. Since natural convection is inherently a slow method of heat transference and it is also difficult to maintain temperature uniformity throughout a charge, in order to obtain the maximum advantages of electric heating, the principle of forced air-circulation is applied. V.F.C. furnaces are widely used in mass production industries for tempering automobile and aircraft engine components, bolts, springs, ball and roller bearings and a wide variety of other equipment.

Low frequency induction melting equipment is of primary interest to the aluminium and brass industries, and in addition is used for zinc, copper and aluminium-bronzes. The "Tama" range of low frequency melting furnaces which are made in ratings varying from 20 to 300 kW are suited to these metals and are of the stationary bale-out, hoist or hydraulic tilting types according to size. One of the main features of this range is the operational advantage that the melting channels may be easily cleaned. The accumulation of oxide, an unavoidable problem when melting various alloys, may be removed without interruption of production. Where larger production rates are required than given by the "Tama" range, "Scomet" furnaces, which also operate on the low frequency induction principle, may be used.

For carbon and alloy steels, special irons, non-ferrous and precious metals, the "Ajax" range of induction melting furnaces are particularly suitable. Typical installations are described with photographic illustrations in the third leaflet and performance figures of the various furnaces, are quoted for metals varying from steel to gold. The range includes 14 different sizes varying from 25 up to 1,500 kW and the largest size can handle up to 5,600 lb/hr with steel.

Electronic Motor Controller

MANUFACTURED by SERVOMEX CONTROLS LTD., Crowborough Hill, Jarvis Brook, Sussex, a new electronic motor controller is claimed to exceed any other commercially available equipment in accuracy and range of control. With large changes of load, or mains voltage and frequency, accurate constant speed is possible over a range of 0–6,000 r.p.m. and switching to preset speeds either by hand or automatically, the set value is reached within 1/10 sec with a claimed accuracy of 2 to 5 r.p.m. according to the nature of the load. The equipment comprises a d.c. motor approximately 1/10 h.p. joined by a flexible cable to the electronic control unit which has a tachometer on the control panel having an accuracy of ±1%.



The instrument has coarse and fine controls and speed setting is possible for 0–6,000 r.p.m. in either direction

A Heated Bed Jacket

THE "Therm accurate" bed jacket made by Inferation Ltd., and handled by DENNIS O. C. LITTLER, 54 Ormsby Lodge, The Avenue, W.4, is an unusual comfort item which is especially suitable for bed-ridden and other invalids.

It is available in three models, the de luxe model made of peach quilted satin lined with crepe de chine and with a frilled edging of georgette at £15. 15s., a short back model measuring 16 in. from shoulder to bottom hem in peach or sky quilted satin lined rayon at £9. 9s., and

No risk or discomfort for invalids results from the use of the "Therm accurate" jacket

a long back model illustrated measuring 26 in. similar to the short model.

Heating is by small flexible heating elements inserted in the back of the jacket. These are supplied with current from a twin heat transformer control box (125° F and 160° F). Great advantage of these jackets is that they may be worn whilst invalid moves from her bed for toilet and other purposes. The jacket retains heat after flexible cord is disconnected by plug from control box and is stowed in pockets provided in the jacket. For washing or cleaning the garment the elements can be easily detached.

TRADE PUBLICATIONS

INSTRUMENTS.—The Cambridge Corrosion voltmeter is described in Sheet No. 314 available from the Cambridge Instrument Co., Ltd., 13 Grosvenor Pl, S.W.1.

LIGHTING.—A brochure has been issued by the General Electric Co., Ltd., Magnet Hse, W.C.2, giving brief recommendations for intending purchasers of fluorescent tubes.

ISOLATORS.—The installation, operation and maintenance recommendations with recommended spares for 132 kV rotary isolators and earthing switches is described in 10 MS No. 420, published by A. Reyrolle and Co., Ltd., Hebburn, Co. Durham.

PADS AND BLANKETS.—Isopads and Isoblankets are listed in price list PBL 55, issued by Isopad Ltd., 30 Rosemont Rd, N.W.3.

INSULATING MATERIALS.—MS4 silicone insulating compound for water proofing and insulating ignition systems and electrical equipment.

CABLE RACKING ETC.—"Unistrut" steel framing is described in a booklet issued by Sankey Sheldon Ltd., 46 Cannon St, E.C.4.

Sunbeam Shavemaster made in U.K.

AMERICA'S Sunbeam "Shavemaster" now made in Britain by SUNBEAM ELECTRIC LTD., 14-16 Old Quebec St, W.1, carries a five-year free service guarantee against defects. Two models are available W-RA (100-140 V and 190-250 V a.c./d.c.) priced 11 guineas including purchase tax, and model W-ZA for a.c./d.c. 210/250 V at 10 guineas. Both are packed in genuine leather cases for carrying and stowage.

The design of the "Shavemaster" is notable. Model W has a large continuous round head which has over 3,000 shaving edges which with the lightning fast cutter makes over 24 million actual shaving actions per minute. The powerful motor is a 16-bar armature series wound type driving the cutter through a long lasting nylon crank shaft drive mechanism.

Due for introduction next year are some of the other well-known Sunbeam productions, the Mixmaster, Ironmaster, toaster, waffle baker, Coffeemaster, egg cooker, cooker and deep fryer, electric blanket, automatic frypan.

The Shavemaster Model WZA

De-Freezing Pipes—a new contractor service

CONTRACTORS can now offer a valuable customer service melting ice in frozen pipes. The equipment for performing this task measures only 23½ in. by 10½ in. by 10½ in. deep, is readily transportable. Known as the "Radford Defroster," it is manufactured by RADFORD ELECTRONICS LTD., 149 Newfoundland Rd, Bristol 2. A 2 kW transformer supplied from normal mains has an output of 200, 300 or 400 A, according to the size of pipe being treated. Two cables are connected to the pipe as close to the frozen portion as possible, and the heavy current that flows is used to melt the ice. For domestic installation on ½ in. pipe, defreezing should be possible within a minute since the rate of melting is claimed to be approximately 9 ft per minute with this bore, when set on the maximum of 400 A. Even so, 200 A is said to be sufficient for domestic requirements, the other settings being available for heavy industrial and waterworks use.

"Switch on Good Drying Weather"

THE new clothes dryer for the home laundry, announced in "E.T." last week, ENGLISH ELECTRIC CO., LTD.'S

For the Electrical Trade

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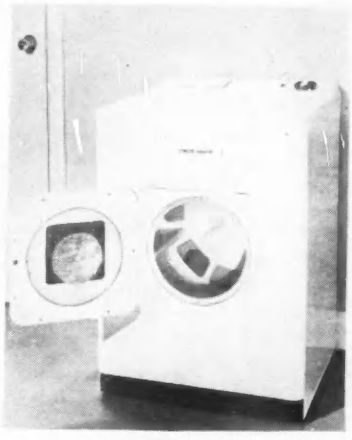
Tumbler Dryer, solves a major problem of how to get clothing conveniently and speedily dried—no matter how temperamental the weather may be

The "English Electric" Tumbler Dryer may be connected in the kitchen by a 15 amp plug. Ideally it should be positioned under or near a window, but it may be placed where there is a free circulation of air. There is only one control, an automatic timer switch which operates the 1/6th h.p. single-phase induction motor for the revolving drum, a 2¾ kW low temperature heater and 2,000 r.p.m. moulded 3-fin fan. The timer is marked from zero to 90 minutes, and the pointer is turned from the off position at zero to select the drying period appropriate to any type of fabric to bring it to ironing dry or bone dry ready to wear.

Up to 8-9 lbs dry weight of clothing may be placed in the Dryer at one time. A load of silks and rayons will be ironing dry in about 20 minutes and a load of shirts and towels in about 60-70 minutes. Price is £69. 10s. 0d., measurements 36 in. by 26¼ in. by 26¼ deep, and finish white or cream with grey toe strip.



No more drying problems

PROBLEMS AND PRACTICE

In Engineering

Brush Flash-over

THE motor driving pumps at a local sewage pumping station had failed to start. A three-phase, slip-ring type, vertically mounted, the machine was provided with a conventional auto-control panel and float switches, and each time it was switched in circuit the o.c.b. tripped. A "Megger" insulation test showed everything in order, whilst nothing was found at fault on the control panel or associated equipment.

The motor was an old type, with a protected enclosure and a mesh band round the cover at the slip-ring end. After removing the mesh, the brushes were lifted, and then, when the motor aborter was switched on, the o.c.b. remained closed. Further examination after removing the end cover completely, then revealed that two of the brush arms had been nearly touching (probably due to vibration) and dust and other circumstances had eventually caused a flash-over. On separation, the motor gave no further trouble.—*J. Colbert.*

Generators in Parallel

IN the issue of 26 Aug., C.L.D. in his article on paralleling generators, points the query of any reader having met any snags in coupling a.c. or d.c. machines. The following two experiences may help to shed some more light on this problem.

Two sets of identical a.c. motor-driven compound wound generators, with apparently the same characteristics, were put down to give a d.c. supply to a bank of machines. The installation was complete for paralleling, with equalising switch, breakers with overloads, and moving iron ammeters. It was found after paralleling that if any adjustments of the rheostats were made, or if the load fluctuated, a heavy current would flow, and bring out the breakers. After fitting moving coil ammeters, and opening the outgoing switch, it was found that this heavy current was from one generator to the other. Internal and external connections were checked, and found to be in order. The series fields were disconnected, thereby leaving the generators as shunt machines, but the heavy circulating current persisted. This problem was overcome by splitting the load, and isolating the generators from each other.

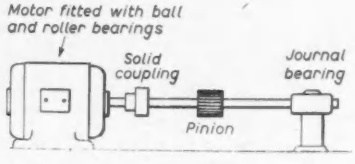
In another installation an extension of the plant called for an increased supply of d.c. supplied, at the time, by mercury arc rectifiers. It was considered that if an auto-synchronous motor was put down to drive a generator, a ready means of improving the power factor would also be available, the generator to be paralleled with the existing mercury arc rectifiers. This arrangement was sanctioned by the makers of the rectifiers, even to sending a representative to demonstrate how to parallel. Here again, after paralleling, if the generator rheostat was moved, or the load fluctuated, a heavy circulating current would flow, blowing the anode fuses, and tripping the breaker. To prove that a reversed series field was not the cause of the trouble, the field was disconnected without effect. This problem was overcome by having the motor generator supplying the periods of heavy demands of d.c. (a satisfactory position as the machine was large enough) and changing over to rectifiers at weekends or on light loads, the paralleling being momentary to avoid interruption of supply.

Practical men with experience of paralleling generators driven by various types of prime movers can only put the failure to parallel in the above problems to the regenerative braking effect of the a.c. motors. The men who make a close study of the theoretical side, do not appear to agree with this theory. But whatever the cause of this phenomena, the problems were never overcome to operate the installations, as put down in the original design.—*J. P.*

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Shaft mis-alignment

MOTORS fitted with ball and roller bearings need special attention when they are driving by means of a solid coupling. Shaft deflection set up by mis-alignment will cause bearing failure and possibly shaft fracture even though the normal working load is well within the capacity of the motor. When, in particular, drives are being modernised and ball-bearing motors installed, a flexible coupling is preferable but if a solid coupling is necessary then accurate setting up is of paramount importance.



Layout of motor, pinion and bearings, which resulted in fracture of motor shaft due to mis-alignment

A recent case involved the fitting of a ball-bearing motor to a travelling crane, where the driven half of the solid coupling carried a shaft whose remote end was supported in a journal bearing. The solid coupling served as a brake drum and the extension shaft carried a pinion driving the hoist mechanism. Due to wear in the journal bearing the extension to the motor shaft was being severely deflected and ultimately the motor shaft fractured.—*Torque.*

Switch Contacts

DIRECT current operated overhead travelling cranes present their own particular problems at any time. When situated in a building with exceptionally low head room the troubles are added to by having to keep a very close watch on the operation of the hoist motion overwinding switches, since they are liable to be called upon to operate more often.

The contacts of the switches in question were of copper and of the butting type. On one or two occasions the contacts would weld together, and consequently the load hook of the crane overran its cut-out point and fouled the rope drum resulting in the breaking of the steel hoist rope.

A close study of the operation of the switches revealed just as the cut-out point was almost reached the pressure on the two butting contacts relaxed, and encouraged an arc to take place between the contact surfaces, sometimes generating heat enough to weld the metals together. As nothing could be done about the design of the overwinding switches, which were of a rather hesitant type, it was decided to make the fixed contact one of metal-carbon construction, and let the moving contact remain as copper. This was an immediate success, no further trouble being experienced on this score.

The metal-carbon type of contact was extended to the drum controllers of the cranes with equal success, the wear on the barrel segments being cut to a minimum and the contact lubrication time being cut out altogether.—*W. J. Coull.*

Poor Craftsmanship

IT has been pointed out by E.N.A. that his previous contribution "Cable Fault Location," published in this feature in our issue of 29 May, 1952, describes a method of locating faults between switch wires and live conductors, as described in the note headed "Poor Craftsmanship," published in the 2 Sept. issue. Its use, he claims, not only effects savings in both time and labour, but would not have necessitated removal of blue phase fuses from houses, with consequent interruption of consumers' supplies.

NEWS OF THE WEEK

Added Scope for Exports in S. Africa

Government announce Relaxation of Import Controls in 1955

IMPORT controls on a wide range of goods will be relaxed next year, the South African Minister for Economic Affairs, Mr Louw, announced in Pretoria last week. Items affected will include industrial machinery, and in this connection, Mr Louw said the S. African Government would allow more to be imported so that the country's manufacturers could equip themselves better to meet foreign competition. He went on to say that during 1955 it was hoped to meet the full requirements of genuine raw materials required for industrial processing. It would not, however, be possible to meet total needs of the assembly industries, although some relief would also be granted to them, he added. As to the future, Mr Louw said import controls would be gradually relaxed and it was hoped to remove all control "in the not too distant future." The rate of improvement will, of course, be determined by the now familiar internal and external trends but there is to be no risk of returning to tighter controls.

Initial steps in the relaxation are that preliminary or automatic quotas for raw materials, consumable stores and maintenance spares will be issued shortly, and will be equal to 90% of the value of total 1954 permits issued to individual importers. The importation of industrial machinery is to be on a more liberal basis than this year.

The existing priority list for consumer goods will remain in force during 1955, with the addition of some items. Preliminary quotas will be increased to 33⅓% of 1948 imports compared with 25% last year, these are supplemented later in the year.

General impression created by Mr Louw's announcement is that although the relaxations will provide extra opportunities for U.K. exporters, the market will tend to be even more difficult than hitherto. South Africa now gives equal consideration to imports from both dollar and non-dollar areas. Consequently, although the Union is one of the world's best markets, and that is as true as regards electrical goods as any others, the British exporter will undoubtedly have to be more competitive.

Five Lectures on Power Transmission

A COURSE of five lectures on Electrical Power Transmission by High-Voltage D.C. begins this evening (14 Oct.) at King's College, London. It is being organised by the University of London King's College in association with the College of Technology, Manchester. Lectures will be given on succeeding Tuesdays and Thursdays throughout Oct. and admission is free.

America meets Britain's Young Engineers

MANY Americans will be the wiser about British engineers following the broadcast from Philadelphia recently of Mr A. J. Nicholas, director of S. Wales Switchgear Ltd., who, during his visit to the States, took part in one of a series of programmes entitled "Meet the Engineer." In the course of the broadcast Mr Nicholas answered questions on the engineer's status in Great Britain.

Speaking from the administrative point of view, Mr Nicholas said he was primarily an engineer and after that many things. He emphasised his strong opinion that the status of the professional engineer should be of the highest and the engineering trained administrators should be the top men in the business. He recommended that all students embarking on an engineering career should attend to the important aspect of gaining administrative experience and at the same time participating in adult education courses. Engineers in Britain were inclined to ignore the training associated with administration, Mr Nicholas said.

He agreed that the profession was growing in importance; the U.K.s economic problems made it essential. There was also a definite trend in Universities towards science, and technical colleges were cooperating fully. Asked about practical training, Mr Nicholas said particular stress was laid on the practical side of the curriculum, and explained the students' various stages of training. He went on to describe the facilities offered to lowly placed boys to attain the standard of a professional engineer during works training.

Replying to a final question, Mr Nicholas said British industry was not satisfied with the number or calibre of science teachers in grammar and high schools, and consequently they were not satisfied that the engineering profession received the right emphasis in our educational system at that level. If there were better lecturers, he said, more students would select the profession as a career. He suggested the remedy was to make science teaching a more attractive vocation.

Discontent with Monopolies Procedure

CRITICISM of the methods of working which the Monopolies and Restrictive Practices Commission has to adopt were voiced last week by Sir Harry Pilkington, President of the Federation of British Industries. He said that the Federation had no complaint against individuals, and considered that the Commision was trying to carry out fairly their duties under the Acts governing them. None the less, he felt that the prescribed method of operations followed by the Commission was producing a real sense of injustice in the minds of responsible people in industries about which a report had been made. At the basis of this was a belief that the Commission's recommendations had been based on evidence which had not been disclosed to the industry concerned, and which the industry had been given no opportunity of refuting.

Electronic Lab. Opened

THE electronics laboratory built by Ferranti Ltd. in Edinburgh, was officially opened by the Duke of Edinburgh on Monday. It has been designed as a centre from which the electronic engineering industry will be developed throughout Scotland, and research engineers will be trained there for service with Scottish firms. It has been established with the co-operation of the Ministry of Supply, the Scottish Council (Development and Industry), the Universities, technical colleges, various Scottish firms and the Admiralty.

M.C.B. COMPANY

SOME additional information can now be given about the M.C.B. Co. (Manchester) Ltd., gazetted in our 9 Sept. issue. The company has been formed primarily to manufacture and promote the use of miniature circuit-breakers. The type to be marketed by the new company in the new year is understood to incorporate several novel features, but full details have not yet been made public. The company's offices are at 6 Melrose Ave, Brooklands, Sale, Manchester. Managing director is Mr H. W. Wolff.

U.S. BID FOR OUR SMALL APPLIANCE MARKET

Complete Range of Chicago Firm's Goods to be made in this Country

BRITISH manufacturers of the smaller domestic appliances can expect strong opposition in future years from the newly formed Sunbeam Electric Ltd., U.K. subsidiary of the giant American Sunbeam Corporation of Chicago. As previously reported in these columns this new company is to occupy a newly built factory at East Kilbride and in the meantime production is starting at Hillington. All the company's plans are still in their early stages, but are proceeding apace. Premises at 14-16 Old Quebec St, London, W.1, were recently taken over and are expected to be ready in about a month from now. There is to be a showroom and complete servicing facilities for the company's products, as well as stores and offices. Similar servicing "stations" and showrooms are to be opened in all main cities and towns in the U.K., and the E. Kilbride factory is expected to be in production by Jan. 1956. Any early rumours there were that Sunbeam would be concentrating on selling to U.S. Forces stationed in this country or Europe, with the U.K. domestic market as an afterthought, can be discounted, the company is out to capture our domestic market from the word go.

A quick start has been made to advertise and sell the Sunbeam Shavemaster, details of which are given on page 565. Stocks are of course limited at the moment, and sales are confined to the south-east quarter of England and the Channel Islands. National distribution of the shaver will probably begin next Jan. A cutout, small counter display showcard, and counter leaflets are available to stockists.

Eventually, the whole of the parent company's range of appliances will be available in this country. Among the first on sale will be the popular Mixmaster, a food mixer. Production is proceeding at Hillington and supplies should be in the shops next March. Their electric fry-pan will probably be on the market next autumn and their cooker and deep fryer early in 1956. Other of the company's products are a coffee percolator, steam or dry iron, toaster, waffle baker, egg cooker, baby's bottle warmer, and electric blanket. Mr. E. S. Northup, managing director, told the ELECTRICAL TIMES last week that a reason why production might tend to be slow, is that all parts made in this country must first meet the requirements of the Chicago laboratories before being assembled in the finished product.

Debut of New Aldis Signalling Lamp

WORTHY successor of the Aldis daylight signalling lamp well known to all seafaring men, the new long range signalling lamp has a light output five times as great as its predecessor.

It differs from the earlier model principally in the method of making the light signals. The earlier model employed a tilting reflector which dipped into the line of sight to make the signal. The new lamp burns at full brilliance all the time, the signals being made by means of a tubular shutter which completely shuts off the light from the lamp and prevents it from reaching the reflector. When a signal flash is made this shutter is withdrawn from the centre of the mirror and the mirror then reflects a full flash. In this way signals can be made at over three dots per second, the equivalent of twelve words per minute. We join in

Restyled both inside and outside the new Long Range lamp is five times as bright

echoing the sentiments expressed in a message passed by naval signallers in a convincing demonstration last week between H.Q.S. *Wellington* at London's Temple, Shell Mex House and the Monument. "The Aldis Long Range signalling lamp bids farewell to its predecessor the Daylight signalling lamp and looks forward to carrying on a proud tradition."

EXPORTS TO SOVIET BLOC — CHANGES ANNOUNCED

REVISIONS in the lists of goods and conditions of trade in respect of exports to the Soviet bloc countries (as distinct from China) have now been all but finalised. New lists of the items controlled by the U.K. for strategic reasons and which cannot be exported without approval have been published by the Board of Trade. The general effect, as anticipated in these columns some weeks ago, is to reduce the embargo list by about 80 items, and the quantitative control list by about 70 items, and to enlarge the area of permitted trade in a large number of categories still controlled. Examples of the last include machine tools, electric generating plant, locomotives and railway equipment.

Following the revision of the strategic control lists, consequential changes have been made in export licensing control. Briefly, licences will not now be required for a number of items including air-conditioning machines, certain co-axial cable machines, certain turbines, photo-electric cells, dynamometers and electro-static precipitators. On the other hand licences will be required for specified turbine parts, steel wire rope and cable, specified electronic equipment and precision instruments and electrical equipment, etc.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS.

B.S. 1557:1954: Polythene-Insulated Cables sheathed with P.V.C. for electric power and lighting up to 250 V; B.S. 2510, 1954: Composite Units of Switches and Fuses for use in industrial systems and domestic circuits.

Amendment Slips: P.D. 1952 amending B.S. 108. (Graphical Symbols for General Electrical Purposes) and P.D. 1953, amending the Supplement to B.530 (Graphical Symbols for Telecommunications).

EXPORT OF GOODS (Control) ORDER (Amendment No. 2) ORDER, 1954 S.I. No 1322. H.M.S.O. 1s. 0d. (See above).

Opening Speeches at Brunswick Wharf

LAST week, we gave a short description of Brunswick Wharf Power Station, the opening of which was performed by Lord Citrine last Wednesday afternoon. Lord Citrine was introduced by Mr H. V. Pugh, controller of the London Division, who acknowledged on behalf of the B.E.A. the excellent work of Poplar Borough Council. In his opening speech Lord Citrine also referred to the initiative and resource of the Council in envisaging such a great project, singling out for mention the Rt Hon C. W. Key, the Mayor of Poplar, Mr R. Illingworth, former Borough Electrical Engineer, and Mr J. Bruce. Mr Illingworth, he said, had been closely associated with the project and was largely responsible for its inception. The Authority, knowing his great interest in Brunswick Wharf, had not sent him to a position where he would have been unable to take part in the culmination of this great enterprise.

Lord Citrine emphasised that it was possible to combine a utilitarian function with beauty, and this was a difficult task which devolved on the Authority. It was not possible in this country to build purely functional stations. Local amenities had to be taken into account.

Referring to atmospheric pollution, Lord Citrine emphasised that in the view of the authority's engineers, gas washing, apart from its high cost was inefficient and increased, rather than diminished, deleterious effects in the vicinity of power stations. The Authority was not prepared to spend millions of pounds on devices which they considered ineffective.

To commemorate the opening a plaque was unveiled by The Rt Hon C. W. Key, and a vote of thanks proposed by Mr R. Illingworth to The Rt Hon. C. W. Key and the Mayor of Poplar.

10-Coach Trains Cause Lighting Problem on Extended Platforms

POST-WAR increases in rush-hour traffic on suburban lines running out of London termini into Kent and Surrey led inevitably to larger trains and an increase from eight to ten coaches. This in turn meant longer platforms, but the problem arose as to how to illuminate them because the extensions were invariably narrow, running as they did into the small amount of space left by the converging tracks. There was not sufficient room on the extended platforms for centrally-placed columns. Consequently floodlights situated at the extremity of the platform were employed, and the British Thomson-Houston Co., Ltd., were called in.

Based on the Mazda "22" floodlight projector, the new platform floodlight has an internal louvre developed by the company's research laboratory, mounted behind a horizontally-reeded diffuser glass. This accurately controls the light, preventing overspill and avoiding dazzle. Installations have been completed at Charing Cross, New Cross and a number of other stations. In each case the projectors are mounted at about 30 ft. At New Cross the platform, extended 240 ft, is now lit by four special 500 W projectors, two at either end. The scheme was planned by B.T.H. and British Railways who also carried out their own installation.

Part of a platform at Charing Cross station illuminated by special B.T.H. floodlight projectors

Annual Ball at Leicester

A PRELIMINARY announcement was made last week concerning the annual ball of the E. Midlands area branches of the E.I.B.A. This event is to take place this year at the Leicester Palais-de-Danse on 2 Dec.

Electric Vehicles and "L" Plates

SUGGESTION that drivers should have to pass separate driving tests for electric vehicles and petrol-driven types has plenty of support in the Midlands at least. The matter was raised recently by Birmingham Accident Prevention Council who sought the support of the Herefordshire, Warwickshire and Worcestershire Federation of the Royal Society for the Prevention of Accidents. That support has been given readily.

It was alleged by Birmingham that due to the fact that electric vans have no accelerator and no clutch, and moreover can seldom travel at more than 20 m.p.h., a test carried out by a learner on one of these vehicles does not in fact prove his suitability for other road vehicles, yet at the moment he is automatically permitted to drive vehicles of other classes on passing the test.

The move is supported by the transport managers of two of Birmingham's biggest electric vehicle users, Birmingham Co-operative Society and Midland Counties Dairy Ltd. The proposal does not apply to pedestrian-controlled vehicles.

The First Half-Century

Professor Silvanus Thompson, in a letter to the *Times* the other day, gave voice to a very general opinion among electrical engineers in his unqualified condemnation of the live rail as an engineering blunder, and asked for a departmental enquiry to step in and prevent electrical engineers from committing our railway systems any further to this dangerous and unnecessary device. 'In ten years time,' he writes, 'there will probably be no "live rail" left. If there is one situation where overhead conductors can be placed and maintained safely, that situation is over a railway—particularly an underground railway.' He also describes the live rail as 'in itself an obsolete device.'—*From our issue of 13 October,* 1904.

£86,000 Lighting Installation at London Airport

ONE of the largest contracts awarded in this country for the illumination of a single building was probably that placed with the General Electric Co. some months ago in respect of workshops and offices of B.O.A.C.'s new headquarters at London Airport. Orders placed to date amount to some £86,000. When complete, the workshops will be 830 ft long and the main span of roof will be 90 ft with a maximum height of 44 ft. Five rows of cold cathode fittings are ceiling mounted and form continuous runs except for interruptions by beams every 16½ ft. The two outer rows and the central row have four intermediate cold cathode tubes to each fitting, while the other two comprise eight-tube fittings. A Delaron plastic reflector is fitted behind each unit and transformers are in cases situated midway between the beams. Similar four-tube fittings have been installed in the aisles at 20 ft centres.

For the building's offices, 1,200 twin-tube cathode fittings to take new warm white 4 ft tubes have been supplied to date. They have louvres and laminating glass side panels. Several offices devoid of natural daylight have cold cathode lighting similar to the workshops. These fittings have been installed on a large scale and number 824 so far. Corridor fittings have reeded glass side panels and are designed to take 4 ft 40 W tubes. Of note, too, is the lighting in the telephone exchange. Twin-tube fittings with 2 ft 40 W lamps are mounted along the top of the switchboard and have open tops so that general illumination is by reflection from the ceiling.

Cold cathode lighting in B.O.A.C.'s new workshops at London Airport; forming part of large orders placed with G.E.C. and totalling some £86,000 to date

Why Neglect Kelvin's Law?

IT has been brought to our attention that in the article "Why Neglect Kelvin's Law," published in our issue of 12 Aug, the figure in column one of Table 1 should have been 1,300 and not 1,450 amps/sq in. This reduces proportionately some other figures in Tables 1 and 2.

E.D.A. BUYS CINEMA ADVERTISING TIME

FOR the first time, the E.D.A. has bought screen space in cinema programmes to publicise electricity. A two-minute film starring Arthur Askey was shown to the Press last week and will be seen by the public in some 2,000 cinemas up and down the country for a period of three months. The film is one of a series of four which will be distributed by all the Area Boards over a full year. They are based on the now familiar campaign featuring the Four Foundations of Modern Living, namely, the electric cooker, water heater, washing machine and refrigerator. Stars of the other three films will be Sally Ann Howes, Cicely Courtneidge, and Jack Hulbert.

The new film is by no means the first made by the Association, who in fact, have a large library of films available. Nor, to be strictly correct, is it the first produced for public programmes. One on fuel saving was shown in cinemas all over the country in the dark days of fuel crises, but screen space was then provided free for the purpose. Times are now very different and space has to be purchased to advise people to use more electricity. The film is called "Before Your Very Eyes," is in Technicolor, and features Arthur Askey being persuaded by his Wiser Self, an animated cartoon figure, to scrap his old fashioned kitchen and cooker and turn to modern cooking with all its conveniences. It was produced by W. M. Larkins and Co. in association with the Film Producers Guild.

Full House for Reading Cookery Demonstrations

OVERWHELMING response to advertisements of cooking demonstrations organised by the Newbury sub-area of the Southern Electricity Board resulted in a second evening's performance being arranged to cater for the demand. The Philip Harben demonstrations were arranged to take place in Olympia Hall, Reading, this evening. This hall holds about 600. This morning it was filled by domestic science students from secondary schools and colleges. During the day, besides Philip Harben's demonstrations there were to be private "demonstrations" by local housewives trying out an electric cooker for the first time. A cooking and water heating exhibition is on view also. Following the demand for tickets, the sub-area, at short notice, arranged for Mr Harben to give an extra demonstration last night.

SHADOWLESS ILLUMINATION

MAKING its first major debut this week is a new architectural lighting system which not only gives uniform almost shadowless illumination but is probably one of the closest approximations to natural daylight in its effect so far developed. Introduced by Lumenated Ceilings Ltd, 4 Lloyd's Ave, E.C.3, the system involves the use of a false ceiling of corrugated translucent vinyl sheet, supported in a light steel framework, and suspended from the true ceiling below the lighting installation, which may employ either tungsten filament or fluorescent lamps. The plastic sheeting diffuses the light energy to form a completely luminous ceiling, devoid of glare, high spots or shadow, particularly suitable where large areas are to be illuminated.

FILMS ABOUT COPPER

TWO new films have recently been produced by the Yorkshire Copper Works Ltd. Of these "The Plumber's Way" is believed to be the first instructional film in which three-dimensional technique has been employed. Intended for showing to trade apprentices, the film was designed to demonstrate simple plumbing jobs using copper tubes and "Yorkshire" fittings, which have internal grooves filled with solder. The use of flux and capillary action of solder were demonstrated and various joints were made.

The second film, in colour but not 3-D, dealt much more widely with the subject of copper; manufacturing techniques, testing and the wide range of applications being shown. The shipping and electrical engineering industries vie with each other for first position as users of copper; the former employs the material for condenser tubes mainly.

Eighth Film Congress

PLANS have now been completed by the Scientific Film Association for British representation at the eighth International Scientific Film Congress in Rome. General films selected for presentation at the film festival include The Gas Turbine, The Linear Accelerator, Ultrasonics, Zoom Lenses and Assam Oil Survey.

A.S.E.E. MEETING AT I.E.E.

THE A.S.E.E. Presidential address will be delivered for the first time this year in the lecture theatre of the I.E.E. The meeting will take place on 26 Oct. Visitors and their ladies are invited, and tickets may be obtained from the secretary of the A.S.E.E..

Third Works Safety Display will be Biggest and Best

ARRANGEMENTS are now well advanced for the next Safety and Factory Efficiency Exhibition which is to be held at the Bingley Hall, Birmingham, between 24 June and 1 July, 1955. This exhibition is held biennially and it is expected that the third show will be even larger and more successful than in 1953, when there was over 10,000 sq ft of stand space, over 50 exhibitors and nearly 20,000 visitors. Special feature of the 1955 show will be an "ideal factory" actually producing goods and laid out to show the best and safest production methods. It will occupy about a fifth of the exhibition space and will be a replica of a modern works complete with clocking-in station, despatch bay, and everything between. The exhibitions are organised by the Birmingham Industrial Safety Group.

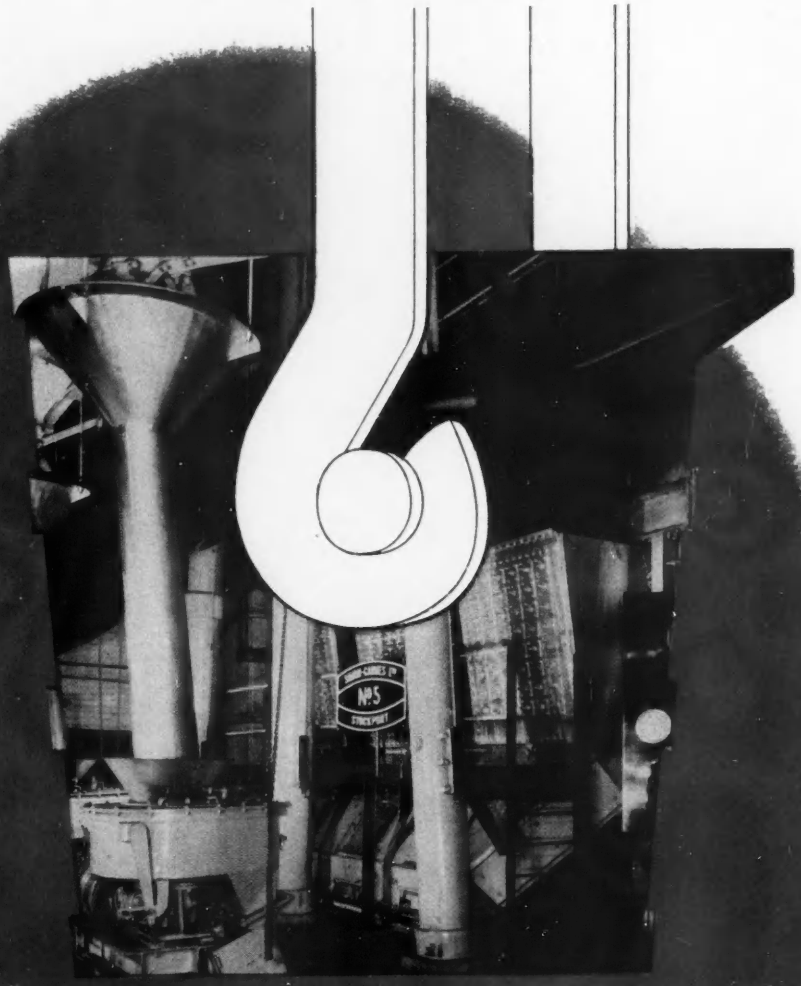
Electronics at Work

AN exhibition of electronic aids to production, design and research is to be held in Birmingham between 23 and 25 Nov. Entitled "Electronics at Work," the display will include working demonstrations showing the use of electronics in a wide range of industrial applications, public services, medicine and education, as well as varied aspects of research and development. Admission will be by ticket which may be obtained from the organisers, The Scientific Instrument Manufacturers' Assoc., 20 Queen Anne St, London, W.1. Venue will be the Chamber of Commerce Hall.

1955 Gothenburg Fair

NEXT year's International Swedish Industries Fair at Gothenburg will take place between 14 and 22 May. Formerly a national exhibition, Svenska Massan, its expansion to an international event has greatly increased its scope. Exhibits are not displayed in national pavilions, but are grouped in commodity sections. Particulars and applications for space may be obtained from John E. Buck and Co., Ltd., 47 Brewer St, London, W.1.

New lighting technique recently introduced by Lumenated Ceilings Ltd. put to good use in a car showroom



STEAM *and the making of steel*

The general expansion in steel production is making complementary demands on Simon-Carves steam raising plant for electricity generation. Four Simon-Carves 87,200 lb/hr boilers have been installed at the Margam works of the Steel Company of Wales and the picture above shows one of the units in a recently commissioned addition of two 100,000 lb/hr boilers in the Simon-Carves boilerhouse at the Ebbw Vale steelworks of Richard Thomas & Baldwins Ltd.

Steam power by Simon-Carves Ltd

SIMON ENGINEERING GROUP

STOCKPORT, ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd: Johannesburg* *Simon-Carves (Australia) Pty Ltd: Sydney*

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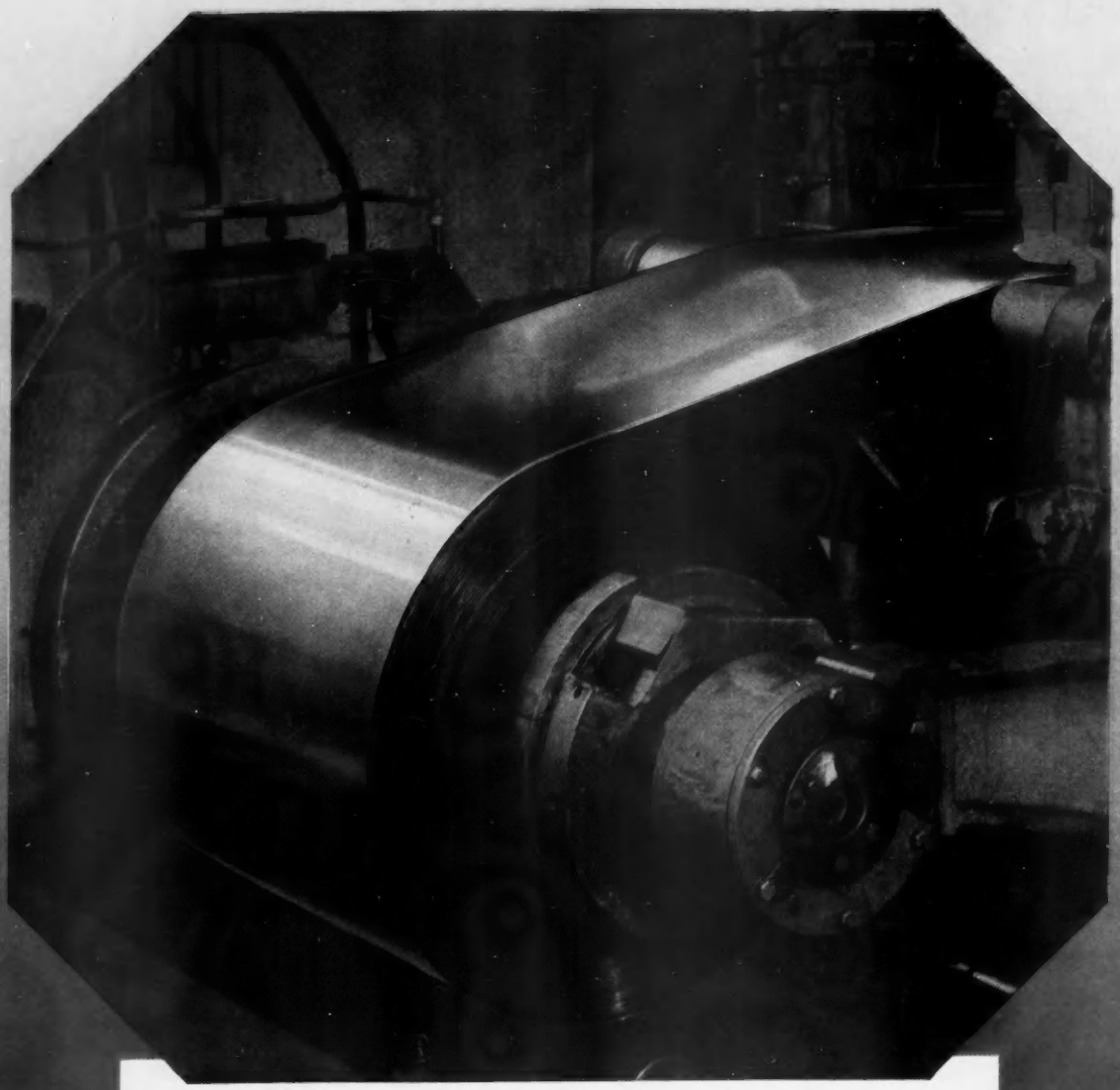

FERROSIL *cold-reduced*
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RTB

More Power to Her Elbow

THE above is the title of an exhibition being staged at Woolwich Town Hall next week by the local branch of E.A.W. It will be opened by the Mayor (Councillor J. W. Andrews) at 3 p.m. on Tuesday and closes at 9 p.m. on Thursday. Admission will be free. A similar exhibition was organised by the S.E. London branch last year at Lewisham when about 2,500 people took the opportunity of trying out electrical apparatus for themselves.

NEWS IN BRIEF

A list of papers to be presented by the British National Committee at the fifth congress of the International Commission on Large Dams of the World Power Conference has been issued by the Committee. The Congress, as previously announced, will open in Paris on 31 May next.

A £40,000 contract with the S.E. Scotland Electricity Board, for 7,050 yd of aluminium-sheathed 33 kV impregnated pressure cable has gone to British Insulated Callenders' Cables Ltd. It will run from Townhill power station to Netherton substation.

Electrically-heated Industrial Equipment is the title of an exhibition being staged this week at the Midlands Board's industrial showroom, 247 Chester St, Aston, Birmingham. It closes at 4.30 p.m. tomorrow (15 Oct.).

Residential study course on Employment, Welfare and Trade Union Relationships is being organised by the Institute of Personnel Management. It will be held from 4 to 7 Nov. at Newbattle Abbey College, Dalkeith.

Conference to examine methods of selecting, training and stimulating the sales force was staged by I.S.M.A. in London last Friday.

Sayings OF THE WEEK

"Power stations producing electricity generated from atomic piles would probably be in use nationally within the next ten to 20 years." . . . MR A. R. COOPER, N.W., Merseyside and N. Wales divisional controller at Rotherham College of Technology Engineering Society.

"I prefer the technically-trained administrator who is capable of judgment and perspective in engineering, accountancy and leadership problems. Such a man cannot have the wool pulled over his eyes." . . . MR A. J. NICHOLAS, director and general manager of S. Wales Switchgear Ltd., in a U.S. broadcast.

"The long-standing objective of the association is to get members licensed or registered in some way." . . . MR A. F. PLUMMER, president of E.C.A. (Southern Section) in Southampton.

ELECTRIC SUPPLY NEWS

Eire

The Electricity Supply Board will have its first major wind-powered generator by next April, a Board spokesman stated last week. A German manufactured 12 kW generator is expected in two months time and will be installed at Verschoyles Hill on the Dublin-Baltinglass Rd. It will generate electricity at between 220 and 360 V which will be stepped up by a 10 kV transformer and fed into the grid. For the past three years, the Board has been co-operating with the Electrical Research Association in recording wind velocities along the Irish coastline, and 18 of those observation posts are still in operation.

Glamorgan

Plans for the proposed new power station at The Leys, near Barry, are expected to be submitted by the B.E.A. to the Glamorgan Planning Committee towards the end of next month. It was reported at a recent meeting of the committee that technical details of the plans which affected the Glamorgan River Board were discussed by representatives of the Board and the Authority in September.

Hemsworth

The Rural Council is opposing conditions which the Yorkshire Electricity Board are seeking to impose for providing a supply of electricity to new housing estates. In a letter to the council the Board expressed concern at not gaining a reasonable return from heavy expenditure involved in supplying new estates. Accordingly, it had become necessary to require owners to do one of three things. They could either provide adequate wiring installations to enable tenants to make full use of the electrical service, and so increase the average revenue per consumer to be received from the estate; they could guarantee a revenue in respect of each estate which would make the scheme an economic proposition; or they could make a capital contribution. The Board stated that the first choice would be the cheapest and would also provide the Board with the opportunity of earning adequate revenue and at the same time bring to the occupants of the houses a freer choice in the methods of cooking and heating, which was the declared policy. If a capital contribution was made it would range from £10 to £20 a house, according to circumstances. The Council is taking the matter up with the Minister of Housing.

North Wales

Criticism of the revised Rheidol and Ffestiniog power schemes has been issued by the N. Wales (Hydro-Electricity) Protection Committee. Neither project is opposed in principle but substantial changes are sought in some features of the schemes which are found "intolerable". Main objection to the Rheidol scheme appears to be that the eastern arm of the main reservoir would drown the fine landscape of the Upper Rheidol Valley. It is suggested that if only the western arm were inundated, no large reduction need be caused in output from the scheme as a whole. Particular concern is also expressed at the 300 yd of exposed pipeline, visible over a large area, which would run down to the power station above Ponterwyd. Other complaints concern the siting of the main power station and of the transformer and switching gear, and distribution lines, the material and colour of the main dam, and the average daily flow to be left in the river.

Complaints of the Ffestiniog scheme follow along much the same lines. Safeguards are sought concerning the design of the power house and dam, the siting of the switching and transformer station and the route of the transmission line to Hawarden in Cheshire. It is feared that a dam across the Afon Stwlan will spoil amenities unless constructed of locally hewn stone to make it as inconspicuous as possible. The 600 yd of overland and exposed pipes is also an intolerable proposal, the committee considers.

Wrexham

A sub-committee of the Rural Council has asked for a meeting with the Merseyside and North Wales Electricity Board to discuss the question of taking supplies to parts of the district which are, at the moment, without electricity.

South West

Tenants on the council estate at Zeal Monachorum were said at Crediton U.D.C.'s recent meeting to have refused an electrical installation until a decision had been reached on the charges to be imposed. Concern was expressed on the fact that some areas had to pay for installations while others had it free, and it was hoped the Council would find some way in this case of paying and recovering the cost elsewhere.

LIGHTING SCHEMES

Lunesdale. R.D.C. to apply for sanction to borrow £2,830 for street lighting installation.

Ramsbottom. The U.D.C. is seeking Ministry approval to the conversion of tungsten lighting in Bridge St to the sodium type. Estimated cost £1,130.

St. Helens. Borough engineer submitting to the Ministry a scheme for improved lighting in various roads, to cost £13,546.

Wellingborough. The U.D.C. propose to erect 95 electric street lamps in place of gas, at a cost of £8,535.

COMPANY ACTIVITIES

THE past week has been a hectic one in London's copper market, the first half of which must have caused some anxiety to copper users. In the first two days the price rose by £17½ to £305 a ton. A little of the gloom was lifted on Wednesday, however, when the price reacted to £293. 10s. a ton, at which figure it ended the week.

The directors of Bennis Combustion Ltd. are planning a reorganisation of the company's plant and machinery which will help considerably in the efficient manufacture of the company's products and speed up the execution of orders. These plans will require the outlay of a substantial sum on additions and replacements. Because of the board's care in building up satisfactory financial resources these can be financed out of the company's internal resources. In reference to the satisfactory cash position of the company, Mr Herbert Harris pointed out at the annual meeting that the contracts at present in progress plus the tax burden made a policy of cash conservation absolutely necessary.

Is it a bad thing for a company's order book to be down on the previous year? The size of one's order book is regulated nowadays as much by delivery dates as by price. In the case of Newton Bros. (Derby) Mr F. V. Pipe, the chairman, says this situation has arisen. It makes possible the quoting of shorter delivery dates which he describes as a useful factor now that certain demands on the company show signs of easing off.

R. B. Pullin and Co., electrical engineers and scientific instrument makers, have acquired the outstanding share capital of Stanley Cox, a world supplier of electro-medical, orthopaedic and physiotherapy apparatus. This latest purchase completes a deal started in 1951.

Big talking point in stock markets last week was the Babcock and Wilcox interim dividend of 7%. Paid on a capital increased by a one-for-two share bonus it is thus equal to 10½% on the old capital compared with last year's payment of 7½%. Discussion is centred around the company's final payment. Last year it was 7% on the present capital which caused some disappointment. General expectations are that there will be some increase on this, and some quarters will again be disappointed if the year's payment is not brought up to the pre-bonus rate of 18%.

—From Our City Correspondent.

Bennis Combustion

Results for year ended 30 April show Group current assets £694,365 (*£534,927*) including investments £41,868 (*same*), tax certificates £31,825 (*£10,000*) and cash £54,135 (*£79,339*). Current liabilities take £289,912 (*£195,684*). Reserves £218,305 (*£162,796*) and £67,600 is allocated for future tax (*£52,700*).

British Colombia Electric

Consolidated gross revenue from operations $50,055,304 (*$47,041,786*) and operating income $5,393,187 (*$4,703,412*). After debenture and bond interest, etc., $2,314,905 (*$2,043,783*), net income of $3,326,137 (*$2,996,559*). Preference dividends $200,068 (*$195,394*), Preferred ordinary $1,098,000 (*$948,240*) and Deferred ordinary $2,068,072 (*$1,817,832*), carry forward $172,025 (*$107,028*).

Cape Electric Tramways

Results for year ended 30 June. Group current assets comprised stores £166,993 (*£200,689*) debtors, loans, prepayments, etc., £52,739 (*£54,403*), deposits at call £135,000 (*£46,000*) and cash £67,640 (*£57,946*), current liabilities £207,904 (*£182,961*) and provisions £89,326 (*£59,621*).

Carrier Engineering

Gross trading profit to 30 June, 1954, £401,267 (*£382,992*), Directors' fees take £20,426 (*same*) and depreciation is allocated £11,939 (*£12,093*) leaving £365,554 (*£347,112*). Current assets are £1,548,085 (*£1,486,071*) including tax certificates £307,950 (*£150,000*), cash £715,777 (*£720,580*), debtors and work £241,650 (*£296,412*) and stock £45,626 (*£82,133*). Current liabilities £310,051 (*£349,300*). Unprovided capital outlay, £140,000.

Holophane

Preliminary results show profit of £117,683 (*£124,164*) of which tax takes £69,350 (*£71,750*) leaving net profit £48,333) (*£52,415*). Balance carried forward £74,135 (*£46,427*).

Midland Industries

Results to year 30 June show current assets £272,258 (*£237,839*) including tax certificates and cash of £139,300 (*£101,730*) against current liabilities £112,462 (*£96,818*). Revenue reserves are £34,180 (*£39,679*) and £51,500 (*£44,800*) is set aside for future tax.

Perak River Hydro

Net profit for year after charging *£250,000* depreciation is £582,151, to which should be added £106,176 brought forward to make a total of £688,327. £348,500 (*£387,500*) is provided for taxation. Preference share dividend takes £34,375 (*£33,594*) and dividend on Ordinary shares takes £96,250 (*£57,750*). This figure is made up 7% dividend plus bonus 3% (*5% and 1%*). £100,000 (*£15,000*) is allocated to general reserve and contingency £50,000 (*£3,066*) leaving a balance of £106,136 (*£106,176*).

Permali Ltd.

The company is to increase capital to £350,000 by the creation of a further 1,000,000 ordinary shares of 2s. each ranking *pari passu* in all respects with the existing ordinary shares of 2s. each. 500,000 of these new shares together with the 250,000 ordinary 2s. shares unissued are to be at the disposal of the Directors in accordance with the company's articles of association.

Palestine Electric and Jerusalem Electric

The take over of the Palestine Electric Corporation and the Jerusalem Electric Corp. by the Israeli Government will be effected next month, according to the managing director of Palestine Electric, Mr A. Rutenberg.

This follows the announcement by the Bank Leunic in Tel Aviv that of the shareholders on the London and principal (Palestine) registers owners of 1,682,000 shares have agreed to sell out to the Israeli Government with 992,000 being exchanged for cash and 690,000 for Israeli Government sterling "A" stock repayable in 15 semi-annual instalments. The Government has purchased outright a block so that only some 75,000 shares remain on the London and principal registers whose holders have not accepted the Government's offer.

Ultra Electric Holdings

Consent of the Treasury has been obtained to enable the directors to issue 357,500 "A" ordinary shares as a scrip issue and 372,500 "A" ordinary 5s. shares by way of rights at 12s. per share. Capital of the company has been raised to £750,000 and £89,375 capitalised out of reserve.

Westinghouse Electric Corporation

This U.S. corporation has purchased the capital stock of the Schneider Manufacturing Corporation of Muncie, Indiana. With this purchase Westinghouse now enter a field regarded as a natural adjunct to the production of power transmission equipment.

Dividends Declared

Alfred Herbert. Tax free interim dividend 2½% on trebled capital as against 5% for corresponding period last year.

Marconi Intl. Marine Concern. Interim div. 4% (*same*) payable 27 Nov.

Skefco Ball Bearings. Tax free interim dividend 5% (*same*) payable 5 Nov.

Calcutta Electricity Supply Corporation. Interim div. of 3% tax free (*same*).

Holophane. Final dividend 17½% (*12½%*) making total for year of 25%.

T. Clarke and Co., Ltd. Interim dividend 9% less tax (*same*), payable 29 Oct.

Babcock and Wilcox. Interim dividend 7% less tax, payable 8 Nov.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

18 Oct.—Dublin. Installation at Male Infirmary, St. Kevin's Institution.—See 30 Sept. issue.

18 Oct.—Maidstone T.C. Installation in 24 flats at Shepway estate.—See 7 Oct. issue.

18 Oct.—N. Ireland. Installation in 255 houses at Rathcoole.—See 30 Sept. issue.

18 Oct.—N. Ireland. Installation in 61 dwellings at Dungannon. — See 30 Sept. issue.

20 Oct.—Dagenham T.C. Supply of 317 Group "B" electric lighting units.—See 7 Oct. issue.

20 Oct.—Newcastle-on-Tyne T.C. Installation in 68 flats and maisonnettes on Elswick St site.—See 23 Sept. issue.

22 Oct.—Londonderry. Electrical installation in stage 2 of New Gransha Hospital. Apply by above date to Secretary of N. Ireland Hospitals Authority, Victory Bldgs, 44-46 Queen St, Belfast.

23 Oct.—Antrim. Electrical repairs, requisites and lamps required by S. Antrim Hospital Management Committee during 1955. Secretary, Dublin Rd, Lisburn.

23 Oct.—Ebbw Vale U.D.C. Rewiring of 272 houses on Glyncoed estate.—Advertised in 7 Oct. issue.

23 Oct.—Newcastle-upon-Tyne T.C. L.T. lead covered cable.—See 7 Oct. issue.

23 Oct.—Northumberland. A 3 kVA engine driven 230 V a.c. generator included in list of items of new highway plant. County Surveyor, Phoenix Hse, Queen St, Newcastle.

23 Oct.—Rochester T.C. Three vertical driven non-chokeable centrifugal sewage pumps, with motors, starters, etc.—See 7 Oct. issue.

25 Oct.—Chelmsford T.C. Supply and erection of 118 class A street lamps on various roads. Borough Engineer and Surveyor, Municipal offices, Duke St. Deposit £2. 2s.

25 Oct.—Hindley U.D.C. Sodium lanterns, lamps, control gear, concrete columns, and 102 steel brackets. — See 30 Sept. issue.

25 Oct.—Longbenton U.D.C. Installations in 312 houses at Annitsford, Forest Hall, Palmersville, and Holystone.—See 7 Oct. issue.

25 Oct.—Southall T.C. Provision of street lighting equipment in Norwood and Greenford Rds. Advertised in 7 Oct. issue.

25 Oct.—West Riding. Conversion from gas to electricity at Goole Alexandra Rd school. Divisional Architect, Bishopgarth, Westfield Rd, Wakefield.

26 Oct.—Southgate T.C. Equipment for street lighting schemes.—Advertised in 7 Oct. issue.

27 Oct.—Bath T.C. Electrical installation in 34 dwellings on Fothill estate. Same in 4 flats and 4 maisonnettes at The Circus. Separate contracts. City Planning Officer and Architect, 7 North Pde Bldgs. Deposit £1. 1s. in each case.

27 Oct.—Manchester T.C. Installation at Wythenshawe West Secondary Technical School.—See 30 Sept. issue.

28 Oct.—Sale T.C. Relighting of Cross St and Washway Rd (A.56) for about 2·18 miles comprising removal of existing tramway columns and supply and erection of concrete columns, lanterns, sodium discharge lamps and time-switches. Borough Engineer's Dept., Town Hall. Deposit £2. 2s.

29 Oct.—Donegal C.C. Installation in new district hospital, Carndonagh.—See 30 Sept. issue.

29 Oct.—Dublin T.C. Supply of electrical test instruments for public lighting dept. Finance Dept., City Hall.

29 Oct.—Kirkcaldy T.C. Electrical work in 150 houses.—See 30 Sept. issue.

29 Oct.—Liverpool T.C. Installation at Westminster Rd county primary school. City Engineer and Surveyor, Municipal Bldgs.

29 Oct.—Llandudno U.D.C. Concrete lighting columns with lanterns.—Advertised in 7 Oct. issue.

29 Oct.—Maybole T.C. 52 lighting points on route A77.—See 7 Oct. issue.

29 Oct.—Oswaldwistle U.D.C. Installation in 32 dwellings on White Ash Estate. —See 16 Sept. issue.

30 Oct.—Adwick-le-Street U.D.C. Supply of equipment for sodium discharge lighting on Great North Rd A.1.—Advertised in 7 Oct. issue.

30 Oct.—Swansea T.C. Supply of sodium public lighting equipment: totally enclosed lanterns, auxiliary gear and lamp brackets. Borough Engineer and Surveyor, The Guildhall.—Advertised in this issue.

1 Nov.—Brighton T.C. Erection etc., of two electrically-driven pumps, control gear valves, recording instruments at Lewes Rd pumping station. Waterworks Engineer, 12 Bond St. Deposit £2. 2s.

2 Nov.—Fleetwood T.C. Electrical work in 48 houses on West View estate. Borough Surveyor, Town Hall. Deposit £3. 3s.

4 Nov.—Belfast T.C. Electrical installation in Ballysillan intermediate school. Education Architect, 40 Academy St.

4 Nov.—Twickenham T.C. Supply and erection of 335 street lighting units comprising lanterns and auxiliary gear for sodium HPMV and/or fluorescent lamps on concrete columns and existing trolley bus poles. Stage 1 of Group A scheme in Hampton Area. Borough Engineer, Municipal offices. Deposit £2.

5 Nov.—Belfast T.C. Supply, erection, etc., of electric hoist-block and 12 in. bore parallel slide valve for steam plant. Electricity Dept., East Bridge St, Belfast. Deposit £1 1s.—Advertised in this issue.

5 Nov.—N. Ireland. Installation in Gardenmore Presbyterian Church, Larne.—See 7 Oct. issue.

5 Nov.—Wrexham T.C. Supply and erection of steel and cast iron columns, lanterns, lamps and time-switches for Group A and B street lighting. Borough Engineer and Surveyor, 31 Chester St.—Advertised in this issue.

6 Nov.—Windsor T.C. Electric lamps, fittings and cable included in supplies required during 1955. Borough Engineer, Kipling Memorial Building.

16 Nov.—Hazel Grove and Bramhall U.D.C. Supply and installation of concrete and steel columns, lanterns, etc., along Buxton and Macclesfield Rds. Engineer and Surveyor, J. Fleming Andrew, Council Hse, Hazel Grove. Deposit £2. 2s.—Advertised in this issue.

18 Nov.—Belfast T.C. Extensions to pneumatic dust removal and surface installation at Power Station West. Form N.1424. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

30 Nov.—Tottenham B.C. Electric lamps in list of supplies wanted in year from 1 Apr. Names by above date to M. Lindsay Taylor, Town Clerk, Town Hall, N.15.

No date stated.—Paulton. Provision of all services, including electricity, for 68 houses.—See 7 Oct. issue.

No date stated—N. of Scotland H.E. Board. Lighting, small power and other subsidiary services for Ceannacroc power station. Kennedy and Donkin, 12 Caxton St, S.W.1. Deposit £2. 2s.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 115 queries answered this week

"Thor" drill as made by Chicago Pneumatic Tool Co., agents for? T.S.—Consolidated Pneumatic Tool Co., Ltd., 232 Dawes Rd, S.W.6.

"Maglow" fires, makers of? L.E.B.—Mabro and Co., Ltd., 113 Euston St, N.W.1.

"Dorman" diesel-generating sets, suppliers of? M.O.W.—John A. Sparks and Co., Ardwell Rd, Streatham Hill, S.W.2.

"Mastic" jointing material, makers of? W.E.L.—London Eng. Co., Ltd., 7 Victoria St, S.W.1.

Infra-red grillers, suppliers of? S.W.B.—M.E.A.C. Ltd., 21 Newman St. W.1; A. E. Warner (London) Ltd., 56 Brewer St, W.1; E. Whitmont and Co., Ltd., 19 Acol Court, N.W.6.

Ham boilers, electrically heated, makers of? S.E.B.—Jackson Electric Stove Co., Ltd., 143 Sloane St, S.W.1, produce a vegetable boiler which can be adapted for this purpose.

"Synchronomains" clocks, makers of? M.N.W. — Synchronome Co., Ltd., Abbey Works, Woodside Place, Mount Pleasant, Alperton, Middx.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

29 Oct.—U.S.A. Voltage regulators for Fort Randall dam site, South Dakota: one 13·8 kV outdoor, step-type; one 13·8 kV regular by-pass switch, and one 480 V indoor induction type. B.o.T. (Ref.: 23064).*

30 Oct.—India. 160 miles of a.c.s.r. conductors, 1 x 0834 steel; and 200 miles ditto with 1 x 0·110 steel, for Mysore Govt. Documents from Trade agent for Mysore in London, 9 Cliffords St, W.1. Rs. 50.

30 Oct.—Portuguese Guinea. Supply and erection of material for h.v. transmission line, for Delegacao Comercial do Ultramar. B.o.T. (Ref.: 23588).*

31 Oct—Iraq. Eight 50 kVA transformers, for Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: 23622).*

1 Nov.—Belgium. Supply and installation of reinforced h. and l.t. cables and equipment valued at £17,000, and supply of five transformers from 30 to 60 kVA 15,000/400 V valued at £1,000, included in work proposed at Weelde airfield. Apply by above date to Ministere de la Defense Nationale de Belgique, Service Travaux Speciaux, Section Electricite et Balisage, Casene Prince Badouin, Place Dailly, Bruxelles.

1 Nov.—India. 320 tons of h.d. bare solid copper wire of various diameters, and 11 tons of h.d. stranded copper conductor, for Mysore Government. Documents from Trade agent for Mysore, 9 Cliffords St, London, W.1.

2 Nov.—India. One 110 kV, 1,500 MVA oil circuit-breaker, six control panel boards, and one set 110 kV class lightning arrestors, for Mysore Government. Trade agent for Mysore, 9 Cliffords St, London, W.1.

11 Nov.—Australia. 60 s.p. relays for feeder protection, "Translay" type, for Sydney C.C. B.o.T. (Ref.: 23125).*

12 Nov.—India. Supply of large quantity of V.I.R. braided and compounded 250V. cable insulated with vulcanised India Rubber single core size 3/·029. Director General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (Ref.: ESB 23914/54).*

16 Nov.—Australia. Twelve split-cone multi-range current transformers, for Sydney, C.C. General manager, Queen Victoria Building, George St, Sydney. B.o.T. (Ref.: ESB 22511/54).

17 Nov.—Australia. Manufacture, supply, etc., of coal handling plant with driving gear for power station at Blackall. State Electricity Commission, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: E.S.B. 23602/54)*.

17 Nov.—New Zealand. Total of 608,400 ft of paper insulated telephone cable, star quad, lead alloy sheathed, steel tape armoured and served, required by Post and Telegraph Dept., Wellington. B.o.T. (Ref.: ESB 23565/54).*

19 Nov.—Thailand. Hydraulic turbines and generators with all necessary electrical and mechanical parts and equipment for Greater Chao Phya project. Royal Irrigation Department, Bangkok. B.o.T. (Ref.: E.S.B. 23851/54)*.

26 Nov.—Australia. Twelve 11 kV, 3-ph., 300 A outdoor oil-immersed, ring-main switchgear, for Brisbane T.C. Town Clerk, City Hall, Brisbane. B.o.T. (Ref.: 22028/54).

6 Dec.—Brazil. State Electricity Commission, Porto Alegre, require supply of 3,045 kilometres steel wool aluminium cable of specified types, and 695 kilometres galvanised steel cable, with accessories. B.o.T. (Ref.: ESB 23847/54).*

17 Jan.—Portuguese E. Africa. System of automatic railway points, traffic control installation and signalling equipment required by Ports, Railways and Transport Dept., Lourenco Marques. B.o.T. (Ref.: ESB 23918/54).*

25 Jan. 1955.—New Zealand. One 30,000 kVA, 110/22 kV transformer bank and spare unit for Otahuhu substation, for State Hydro Electric Dept, comprising four 1 ph. double-wound transformer units, each 10,000 kVA, 110/12·7 kV, outdoor type, oil immersed, with natural cooling and on-load tap changing. Details from N.Z. Government office in London.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 12 October

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	282½	−27½	236½
,, (3 months)	265	−19½	221½
LEAD, refined pig, min. 99·97% purity (cash)	107½	−2½	89½
,, (3 months)	103½	−2½	87½
TIN, refined, min. 99·75% purity (settlement)	732½	−4	606½
,, (3 months)	732½	−4	588½
ALUMINIUM, ingots 99·99·5%	150	—	150
ZINC, virgin, min. 98% purity (cash)	83½	+½	72½
,, (3 months)	83½	+½	70½
RUBBER No. 1, RSS. spot (per lb.)	23½d.	+1½d.	16½d.
,, c.i.f. basis, ports. Nov. (per lb.)	22½d.	+1d.	16½d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	50½
Mild Steel Tape (0·014 in.)	40½	—	40

Contracts Placed

Bridgwater T.C. Supply and erection of 50 concrete columns, lanterns, control gear, etc., for street lighting, General Electric Co., Ltd., £3,472.

Gloucester T.C. Installation in Eastern Ave. fire station, W. T. Turner and Co., £2,884.

Ilford T.C. Supply of diesel alternator set for Roden St pumping station, Blackstone and Co., Ltd., £5,557; also control panels, switchgear and starters for same, Igranic Electric Co., Ltd., £5,230.

Keswick (Cumb.) U.D.C. Supply and erection 37 concrete columns and fluorescent lanterns for street lighting, Revo Electric Co., Ltd., £2,956.

Warrington R.D.C. 100 "SO Fifty" lanterns, lamps and gear, Metropolitan-Vickers Electrical Co., Ltd., £2,081.

Gazette Announcements

COMPANIES ACTS

Articair Refrigerators Ltd. John B. Clifford, of 4 Bucklersbury, London, E.C.4, has been appointed liquidator.

Rogers and Hall Ltd. Resolution for voluntary winding-up passed at meeting on 21 Sept. and Kenneth Greenlees Winward of 79 Marlowes, Hemel Hempstead, has been appointed liquidator. Creditors are asked to send particulars to liquidator by 21 Oct.

Electronics (Liversedge) Ltd. Meetings of members and creditors will take place at office of Armitage and Norton, Atlas Chambers, King St, Leeds, on 5 Nov. at 11.30 a.m. and 11.45 a.m. resp. to receive liquidator's report.

Innocent (Refrigeration) Ltd. Meetings of members and creditors will be held at offices of Edward Thomas Collins and Son, 28 Baldwin St, Bristol, on 5 Nov. at 10.45 a.m. and 11.15 a.m. respectively to receive report of liquidator.

Electrical Developments Co. (Chester) Ltd. On 5 Nov. meetings of members and creditors will take place at 11.30 a.m. and 12 noon respectively at 41 North John St, Liverpool, to receive liquidator's report.

Hunt and Co. (Newark) Ltd. Resolution for voluntary winding-up passed at meeting on 27 Sept. T. W. Snook, of 113 Harrow Rd, Wollaton Park, Nottingham, has been appointed liquidator, and creditors are asked to send particulars to him by 25 Oct. [This was formal notice only. Business carried on by this company has been transferred to an associate company.]

Partnership Dissolved.

Partnership between Alexander Graham and Geoffrey E. Hill, trading as Graham Hill and Poole, electrical engineers and contractors at New Rd Works, Netherton, Dudley, dissolved from 22 Sept. Debts received and paid by A. Graham.

BANKRUPTCY ACTS

Appointment of Trustee.

Salisbury. William H. T. Mason, electrical engineer trading as W. H. Mason and Son at Castle St, Mere. Trustee is H. P. Tripp, cert. acc., of 34 Fisherton St, Salisbury.

Intended Dividends.

London. Sydney I. Chapman, trading as S. Chapman and Co., electrical agent at 103 Endsleigh Court, W.C.1. Last day for receiving proofs, 19 Oct. Trustee is W. F. Cresswell, Official Receiver, Bankruptcy Bldgs, Carey St, W.C.2.

Great Grimsby. Brian T. Smith, electrical engineer trading at The Studio Ramsgate, Louth. Last day for receiving proofs, 26 Oct. Trustee is L. F. McCulloch, 26 South Saint Mary's Gate, Grimsby.

Dividends

Exeter. Robert J. Camden, electrical engineer trading at 32 New Bridge St, Exeter. First dividends of 2s. in £ payable at office of E. T. Collins and Son, 28 Baldwin St, Bristol, on 23 Oct.

BUSINESS PROSPECTS

Aberdeen. Plans to be prepared for technical school on site bounded by Charlotte, John, George and Craigie Sts.

Accrington. C.E. Day School Assoc. proposes to build a new Church of England secondary modern school at Moorhead.

Altrincham. J. Henry Sellers and Son, 78 King St, Manchester, are architects for proposed extensions to factory at Woodfield Rd, for Budenberg Gauge Co., Ltd.

Bath. J. Cromer Ltd., Union St, are planning to extend their premises at cost of about £60,000. Quantity surveyors are W. E. Underwood and Son, 21 and 22 Gay St.

Bathavon (Som.) R.D.C. Eighty houses to be built at Batheaston during 1955 as well as six bungalows at Peasedown.

Boscombe (Hants). It is proposed to erect three-storey pathological laboratory at Royal Victoria Hospital. Cost estimated at £30,000.

Bridgnorth (Salop). Factory to be built at junction of Stourbridge Rd and the old Kidderminster Rd by Star Aluminium Co. Ltd., of Wolverhampton.

Chesterfield. Boots the chemists are to carry out £36,000 extension scheme to their High St premises. Work to begin early next year.

Coulsdon (Sur.). Additional storey to be built at male nurses' home and also a male occupation centre at Cane Hill Hospital.

Doncaster T.C. Application to be made to borrow £30,048 for erection of Martin proposed primary school.

Dublin. R.C. church to be built at Clonskeagh. Architects are Jones and Kelly, 17 South Frederick St.

Gateshead. G. H. Gray, Camden St, North Shields, is architect for proposed 18,000 sq ft factory additions for Hunters Ltd., Team Valley Trading Estate.

Glamorgan. E. C. Harris and Partners, 2 Bedford Sq, W.C.1, are quantity surveyors for proposed factory on Treforest estate for General Paper and Box Manufacturing Co., Ltd.

Greenisland (Antrim). Erection of 283 dwellings for Northern Ireland Housing Trust, 12 Hope St, Belfast.

Greenwich. It is proposed to rebuild local fire station at cost of about £108,100.

Hackney B.C. Scheme proposed for erection of 16 maisonnettes and 51 flats on Clapton Common (No. 6) site. Estimated cost £68,658.

Halifax T.C. Preliminary plans approved for fire station at Illingworth.

Hamilton T.C. Dean of Guild Court has approved plans for 50 houses on Udston-Hillhouse scheme fourth development.

Hampstead. Plans in hand for erection of day special school for handicapped children in Avenue Rd. Estimated cost, £74,715.

Haslingden. Plans for £150,000 factory for Durie and Miller Ltd, Rochdale Rd, Bury, by Borough Engineer's Dept.

Islington B.C. Erection of four-storey block of 16 dwellings in Bavaria Rd. Town Clerk, Islington Town Hall, Upper St, N.1.

Lambeth B.C. Scheme for development of Cobbett Rd site proposed. It comprises total of 22 flats and 179 maisonnettes and is estimated to cost £511,040.

Lanark. Approval given to erection of schools at Craigbank Rd, Strutherhill and Whinnie-Knowle, Larkhall. Cost estimated at £130,000.

Leamington Spa T.C. It is proposed to build 13 shops in Crown Way on Lillington estate.

Liverpool. T. M. Alexander and Son, 60 Cable Drive, are architects for proposed factory etc at Brookfield Drive, Fazackerley, for Lovell and Christmas Ltd., 16 School Lane.

Liverpool T.C. Scheme for £500,000 shopping centre at Speke approved by Housing Committee.

London. L. Solomon, Son and Joseph, 21 Bloomsbury Way, W.C.1, are architects for proposed £115,000 factory for J. Collett Ltd., 41 Charterhouse Sq, E.C.1. Also A. A. Broadman, 24 Sackville St, W.1, is surveyor for factory at Ormside St, S.E.15 for B. and B. Plating Works.

Loughborough. New Thorpe Acre primary school to be built during present financial year. Cost estimated at £57,000.

Manchester. Scheme being considered for proposed extension of Davyhulme sewage works. Electrical services reported to be most complex and probable cost estimated at £300,000. Consulting engineers to be appointed and will probably be Kennedy and Donkin.

Manchester. R. Jay, 3 Kenilworth Rd, Thornham, Rochdale, is architect for proposed factory extensions for John Chadwick and Sons (Knott Mill) Ltd, at Booth St, Newton.

Middlesbrough. Murray and Charleton Ltd., Marton Rd, to erect offices, showrooms, garage and filling station in Acklam Rd. Another storey to be added to J. Newhouse Ltd.'s departmental store in Newport Rd.

North Riding. Extension of school building programme for next two years will include county modern schools at Skelton, Thornaby and Eston; additions to Lady Lumley school, Pickering, and to Joseph Rowntree school at New Earswick.

North Riding. D. C. Hall, 6 Masons Yd, Duke St, S.W.1, is architect for school at Redcar.

Northumberland. Wiring at Morpeth King Edward VI grammar school to be renewed at estimated cost of £3,000.

Norwich. Tenders may soon be invited for erection of junior school on Heartsease estate at cost of about £78,704.

Nuneaton T.C. Construction of 48 flats in Vernons Lane. Borough Surveyor, Council House.

Ongar (Essex) R.D.C. Erection of block of 4 shops and 4 maisonnettes and another of 4 old people's dwellings and 4 maisonnettes at Shelley. R. L. Luck, Engineer and Surveyor, Council offices, Bowes Field, High St, Chipping Ongar.

Peterborough T.C. It is proposed to build 76 houses and 24 bungalows for old people on Welland Rd estate.

Portsmouth. Tuberculosis unit and new out-patients dept. to be built at St James's and Royal Hospitals respectively.

Rochdale. Plans for factory at Spotland for Turner Bros. Asbestos Ltd, Trafford Pk, Manchester, approved by T.C.

Salisbury. Scheme proposed for complete rewiring of Old Manor Hospital. Cost estimated at £14,000.

Sedgefield R.D.C. Erection of 70 houses being considered near Holmside Ave and Bearch Grove, Trimdon. Housing Architect.

Shoreditch B.C. Scheme in hand for construction of total of 135 flats and 40 maisonnettes adjoining Arden estate.

Slough T.C. Erection of 398 dwellings on Wexham estate. E. Gardner Thorp, Borough Engineer, Town Hall.

Somerset. Provisional building programme for 1955-56 contains 242 projects with an estimated capital value of £1,415,684.

Stanground. Charles W. Skelton Ltd., Eastgate, Peterborough, propose an estate of 655 houses on land adjoining Stone House Farm, Whittlesey Rd.

St. Helens. Plans to be prepared for Carr Mill junior school.

St. Ives (Hunts) R.D.C. Rewiring of council offices being considered.

Stockport T.C. Erection of 71 and 55 dwellings on Brunnington estate, Borough Surveyor, Town Hall.

Tiverton (Dev.). Batten and Thorne Ltd., Bampton St, to erect showrooms, etc. Architects are Dixon and Prochard, Central Chambers, 25 St. Peter St.

Tynemouth T.C. Plans for £750,000 five storey flats and maisonnettes approved by Housing Committee. Architects are A. K. Tasker and A. Child, 25 New Bridge St, Newcastle-on-Tyne.

Wandsworth. Scheme in hand for rebuilding fire station at cost of about £107,650.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Intervision. B723,679. Class 9. Apparatus and parts for use in transmitting and receiving broadcast televised images. Pye Ltd., Radio Works, St Andrews Rd, Cambridge.

Sipo. 730,490. Class 9. Accumulators, electric cells and parts. Allan Levin Ltd., 4 Drapers Gardens, Throgmorton Ave, E.C.2.

Cronapres. 731,944. Class 9. Bell systems, conductors, transformers, bells, etc. Cronapress Co., 19 Goodshaw Ave, Crawshawbooth, Rossendale, Lancs.

TRADE NOTES

Argentine Imports. Central Bank to allow imports of goods valued at 28·2 million pesos from Sterling Area, France and the Netherlands. Goods include materials for manufacture of batteries and tube lighting.

To encourage export of Argentine-made washing machines, the Central Bank will convert foreign currency earned at the free market exchange rate in future.

Telegraphic Address of Permali Ltd.'s main office and works at 125 Bristol Rd, Gloucester, is now Permali Gloucester.

E.W.F. Member. V. Leonard and Co., 40-48 Berry St, Belfast, have been elected members of the Wholesalers Federation.

Overseas

Saudi Arabia. Quotations from U.K. manufacturers sought for air conditioning equipment, well boring equipment and domestic washing machines for sale in Syria by the electrical firm of Mouaffac Midani, Rue Fouad Ier, Damascus.

MEETINGS TO NOTE

THURSDAY, 14 OCT.

I.E.E. (N. Midland). "Fluorescent Discharge-Tube Circuits and Operating Problems," J. Cates. Elect. Offices, Ferensway, Hull, 7.15 p.m.

I.E.E. (N. Scotland). Chairman's address by J. E. Whittaker. University College, Dundee, 7 p.m.

I.E.E. (S. Western). Chairman's address by H. C. O. Stanbury. Elect. Showrooms, Prudential Buildings, New George St, Plymouth, 3 p.m.

I.E.E. (Swansea). Chairman's address by G. D. Curtis. Elect. Showrooms, The Kingsway, 6 p.m.

INCORP. PLANT ENGRS. (Kent). Discussion on "Air Pollution." Central Hall, Chatham, 7 p.m.

I.E.S. (Manchester). "The Social Significance of Lighting," L. T. O'Dea. Town Hall, 6 p.m.

INSTN. OF MECH. ENGRS. Annual Dinner. Dorchester Hotel, W.1, 7 p.m.

INST. OF FUEL. "Heat Transfer in a Continuous Reheating Furnace," and "The Significance of Sectional Heat Balances and Burner Performances in Furnaces," Prof R. J. Sarjant, Dr D. Smith and Dr N. P. Bacon. Gt. George St, S.W.1, 5.30 p.m.

FRIDAY, 15 OCT.

I.E.E. (London Students). Autumn dance at Victoria Halls, W.C.1, 7.30 p.m.

JNR. INSTN. OF ENGINEERS. "Problems Relating to Meter and Instrument Bearings," G. F. Shotter, 14 Rochester Row, S.W.1, 7 p.m.

MANCHESTER ASSCN. OF ENGRS. "Metals—Their Use and Testing," L. E. Benson, Engineers' Club, Albert Sq, 6.45 p.m.

E.P.E.A. "Electronic Development Applied to Microscopy," W. Burrells. Caxton Hall, Westminster, S.W.1, 6.30 p.m.

INSTN. OF MECH. ENGRS. Presidential address, Dr R. W. Bailey, 5.30 p.m.

MONDAY, 18 OCT.

I.E.E. (London). Discussions on "Electricity in the Future." J. Eccles. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Experimental Synthesis of Speech." W. Lawrence. Royal Instn., Colquitt St, Liverpool, 6.30 p.m.

I.E.E. (N.E. Radio and Measurements). "Measurement as a Factor in Understanding." K. J. R. Wilkinson. King's College, Newcastle, 6.15 p.m.

I.E.E. (Reading). "Future of Electronics in Industry." E. R. Davies. George Hotel, 7.15 p.m.

BIRMINGHAM ELECTRIC CLUB. "TV Cameras for Broadcast Industrial and Underwater Purposes." B. V. Somes-Charlton.

IPSWICH ELECTRICAL ASSOC. "Recent Developments in Electricity Generating Station Design." T. Yule. Electric Hse, 7.30 p.m.

INCORP. PLANT ENGRS. (Merseyside and N. Wales). "Repairs of Cracked Castings." N. Tinwell. Radiant Hse, Bold St, Liverpool, 7.15 p.m.

TUESDAY, 19 OCT.

I.E.E. (London Students). Chairman's address: "History of the Institution." M. C. Cubitt. Public Library, Chelmsford, 7 p.m.

I.E.E. (London Measurements). Chairman's address by M. Whitehead. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland Utilisation). "Electricity in Wool Textile Industry." A. J. Francis and T. H. Carr. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N.W. Supply). "Possibilities of Cross-Channel Power Link between British and French Supply Systems." D. P. Sayers, M. E. Laborde, and F. J. Lane. Engrs. Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland). "Analogue Computor for Use in Design of Servo-Mechanisms." E. E. Ward. Carlton Hotel, North Bridge, Edinburgh, 7 p.m.

BUILDING TRADES EXHIBITION. Manchester. Open until 30 Oct.

INCORP. PLANT ENGINEERS (S. Wales). "Power Factor in Industry." W. P. Warren. Mackworth Hotel, Swansea, 7.15 p.m.

I.E.S. (Liverpool). Chairman's address, G. W. A. Illingworth. 24 Dale St, 6.30 p.m.

I.E.S. (Glos. and Cheltenham). Annual Dinner. Belle Vue Hotel, Cheltenham.

INSTN. OF PRODUCTION ENGRS. "Ultrasonic Machining of Hard Metals," C. F. Brockelsby. 10 Chesterfield St, W.1.

WEDNESDAY, 20 OCT.

I.E.E. (Sheffield). Chairman's address by F. L. Parkin. Grand Hotel, 6.30 p.m.

I.E.E. (N.W. Radio). "Measurement of Small-Signal Characteristics of Transistors," E. H. Cooke-Yarborough, C. D. Florida and J. H. Stephen; "Versatile Transistor Circuit," E. H. Cooke-Yarborough; "Transistor Regenerative Amplifier as Computor Element," G. B. B. Chaplin. Engrs. Club, Albert Sq, Manchester, 6.45 p.m.

I.E.E. (Southern). "Electric and Diesel-Electric Traction." R.A.F. Tech. College, Farnborough, 7.30 p.m.

INTERNATIONAL MOTOR EXHIBITION. 39th show at Earls Court, London. Continues until 30 Oct.

INCORP. PLANT ENGRS. (Glasgow). "Gas Turbines." A. W. Vickers. Scottish Building Centre, Sauchiehall St, 7 p.m.

I.E.S. (N. Lancs). Presidential address, E. C. Lennox. 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Glos. and Cheltenham). Annual M. W. Peirce. Cleveland Sc. and Tech. Inst., Corporation Rd, 6.30 p.m.

A.S.E.E. (Nottingham and Birmingham). Haldane regional lecture: "Colour TV," Dr J. A. Derbyshire. Regent Hall, Mansfield Rd, Nottingham, 7.30 p.m.

A.S.E.E. (Southampton and Bournemouth) "Electric Cables" and "Rubber and Termo Cables." F. E. Everard and S. G. Crooks. Polygon Hotel, Southampton, 7.15 p.m.

A.S.E.E. (Manchester). "Modern Lighting Technique," Raymond Pye. Engrs. Club, Albert Sq, 7.30 p.m.

A.S.E.E. (S.W. London). "Automatic Control in Industry," Dr W. L. Stern. Guild Hse, Worple Rd, Wimbledon, 8.15 p.m.

THURSDAY, 21 OCT.

I.E.E. (London Utilisation). Chairman's address by J. I. Bernard. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Irish). Chairman's address by R. C. Cuffe. Trinity College, Dublin, 6 p.m.

A.S.E.E. (Watford). "Electricity in the Paper Making Industry," W. Tait. Clarendon Hotel, Station Rd, 8 p.m.

A.S.E.E. (Kent). "Large Electrical Installations," W. F. Parker. Rose and Crown Hotel, Tonbridge, 8 p.m.

FRIDAY, 22 OCT.

INSTN. OF MECHANICAL ENGRS. "Modern Developments in Use of Large Single Entry Centrifugal Pumps." H. H. Anderson. 5.30 p.m.

I.E.S. (Bath and Bristol). "An Analytical Approach to Industrial Lighting," W. I. Smith. Royal Hotel, Bristol, 6.15 p.m.

INSTN. OF MECH. ENGRS. "Modern Developments in the use of large Single-entry Pumps," H. W. Anderson, 5.30 p.m.

SATURDAY, 23 OCT.

A.S.E.E. (Oxford) "Power Factor Correction," E. A. Benwell. Y.M.C.A., 10 George St, 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Micaramic Elements Ltd. 59/65 Cross Rd, East Croydon, Surrey. Manufacturers and vendors of electrical elements, etc. Nom. cap.: £1,000. Dirs.: A. A. Smith, C. L. Grimwood.

J. Pendergast Ltd. 97 Castle St, Edgeley, Stockport. Electrical engineers and general electrical installation contractors, wireless and television engineers, etc. Nom. cap.: £2,000. Dirs.: J. Prendergast, J. J. Pendergast.

Balmore Electrics Ltd. Electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Jean Herbert and Claire Moore, 128 Albany St, N.W.1.

Lintronic Ltd. 16 Old Broad St, E.C.2. Manufacturers of and dealers in electrical and mechanical instruments and machinery etc. Nom. cap.: £1,000. Dirs.: Homer Chuen-Sen Ling, G. F. Tagg, E. W. Ling, G. Shung-Ching Lung and P. G. Fagg.

Neon Designs Ltd. 1a Eastern Ave, Reading. Manufacturers of and dealers in neon and electric and other signs, etc. Nom. cap.: £100. Dirs.: A. W. A. Howell and Ruth S. Howell.

Neon (Northern Counties) Ltd. 274 New Cross Rd, S.E.14. Maintainers, servicers, erectors and manufacturers of metal, electrical and other signs, etc. Nom. cap.: £3,000. Dirs.: J. H. G. Pearce, H. J. M. Millican and F. W. Allen.

I. G. Bailey and Co., Ltd. 51 Bearton Green, Hitchin, Herts. Radio, television and electrical engineers, etc. Nom. cap.: £2,000. Dirs.: I. G. Bailey and Phyllis M. Bailey.

J. L. Robson and Son Ltd. 87 High St, Marske-by-Sea, N. Yorks. Motor, mechanical, electrical and general engineers, etc. Nom. cap.: £100. Dirs.: J. L. Robson and Mrs M. Robson.

K. Blair Ltd. Manufacturer of electrical gas and oil lamps, bells, switchboards, dynamos, motors, armatures and general electrical and gas plant, etc. Nom. cap.: £2,000. Dirs.: K. I. W. Blair and Mrs E. D. Blair, 31 Byron Rd, Mill Hill, N.W.7, and F. R. Garrod, 35 Birkbeck Rd, N.W.7.

Rotapower Ltd. Mechanical, electrical and general engineers, tool makers, needle and pin makers, etc. Nom. cap.: £1,000. Dirs.: E. Myers, Meads, Wigton Lane, Alwoodley, Leeds, and S. Simmons, 40 Easterley Av, Leeds, 8.

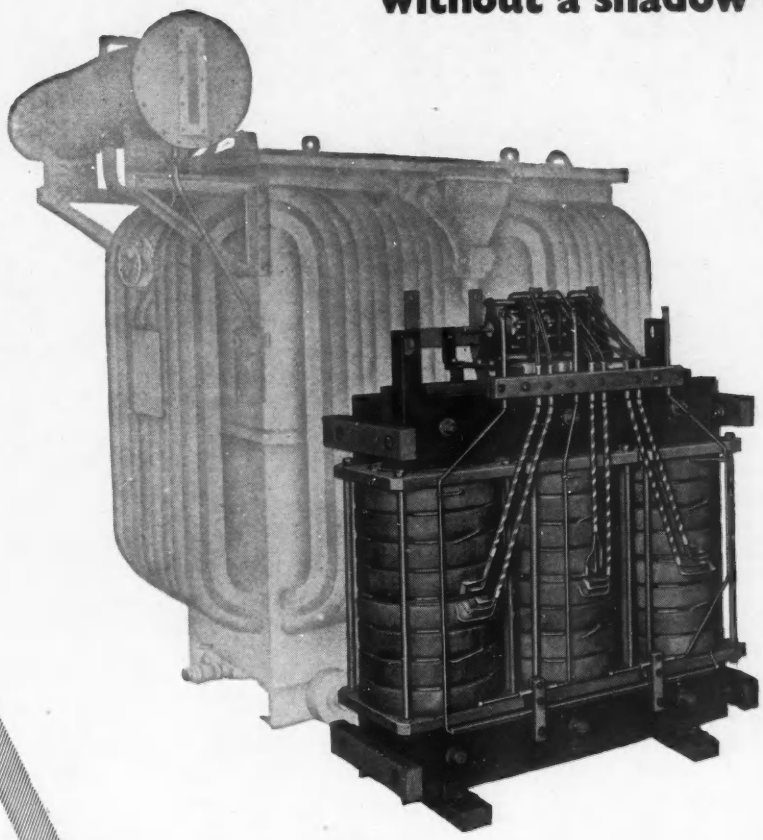
Radio Mailing Ltd. 164 King St, Hammersmith, W.6. Manufacturers, distributors and sellers of radio, electrical and engineering chassis parts, etc. Nom. cap.: £100. Dirs.: B. J. Benzimra and A. S. Williams.

Kimor Ltd. Barons Quay, Northwich, Cheshire. Manufacturers of and dealers in wholesale electrical goods and apparatus, etc. Nom. cap.: £2,000. Dirs.: T. R. G. Moore and J. A. I. Knight.

Nicholls Bros. Ltd. 74 High St, Braintree, Essex. Wireless, television, electrical and general engineers, etc. Nom. cap.: £10,000. Permnt. dirs.: P. J. Nicholls and F. S. Nicholls.

Reg. J. Stainsby Ltd. Lynn Rd, Heacham, Kings Lynn. Motor, aeronautical, electrical, mechanical and general engineers, etc. Nom. cap.: £2,000. Permnt. mang. dir.: R. J. Stainsby.

without a shadow of doubt...



HACKBRIDGE

for distribution and small power transformers

Send for publication DB 10

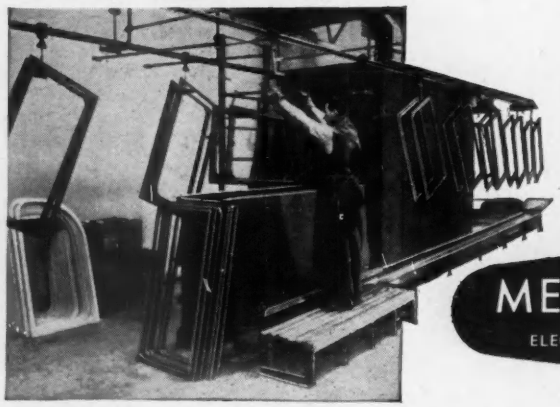
HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone : Walton-on-Thames 760 (8 lines) *Telegrams : "Electric, Walton-on-Thames"*

TQ.

METROVICK FOR ALL INDUSTRIAL HEATING

Dielectric pre-heating of plastic pellets.

Tubular-element Roller Heater.



Infra-red paint stoving of window pans.

Whether you make cars or castings, buses or buttons, you can speed production while saving time and money by the use of Metrovick heating for all industrial processes. Accelerated drying of paints and varnishes ; industrial elements ; dielectric heating of powders. . . . These are typical of hundreds of uses for Metrovick heating equipment. M-V engineers will gladly advise on the most suitable installation for your works.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the A.E.I. group of companies.

L/I 301

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF WREXHAM

GROUP "A" AND "B" STREET LIGHTING

TENDERS are invited for the supply and erection of the following items:

54 No. Cast Iron Columns and brackets having a mounting height of 15 ft.

30 No. Steel Columns and brackets having a mounting height of 25 ft.

16 No. 250 W Mercury Vapour Lanterns and lamps.

14 No. 140 W Sodium Vapour Lanterns and lamps.

5 No. Triple 80 W Fluorescent Lanterns and lamps.

20 No. Timeswitches.

Conditions of Contract may be inspected at the office of the Borough Engineer and Surveyor, 31 Chester St, Wrexham, from whom copies of the Specification and Forms of Tender may be obtained.

Tenders in the appropriate plain envelope sealed and endorsed "Street Lighting" should reach the undersigned not later than first post on Friday, 5 Nov.

The Council do not bind themselves to accept the lowest or any tender.

PHILIP J. WALTERS,
Town Clerk.

Guildhall,
Wrexham.
Oct. 1954. (N 389)

CITY OF BELFAST
Electricity Department

ELECTRIC-HOIST BLOCK: PARALLEL SLIDE VALVE

TENDERS are invited for:

(*a*) Supply, delivery and erection of electric hoist-block (Specification No. W.50).

(*b*) Supply and delivery of 12 in. bore parallel slide valve for steam plant (Specification No. W.52).

Forms of Tender and specifications may be obtained at the Electricity Department, East Bridge St, Belfast, on payment of a deposit of one guinea in respect of each item (*a*) or (*b*), which will be refunded provided a bona fide Tender is lodged and not withdrawn. Extra copies may be obtained at half a guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each Tender, in sealed envelope marked "Tender for ....., Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 5 Nov., 1954.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any Tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
P.O. Box 234.
8 Oct., 1954. (N 410)

URBAN DISTRICT COUNCIL OF ADWICK-LE-STREET

SODIUM DISCHARGE LIGHTING, GREAT NORTH ROAD, A.1.

TENDERS are invited for the lighting of about two miles of Trunk Road as follows:

(*a*) Supply of Lighting Equipment.

(*b*) Supply and erection of columns and installation work.

(*c*) Supply and laying of cables.

Drawings, specifications, bills of quantities and form of tender may be obtained from, and the conditions of Contract inspected at, the office of the Engineer and Surveyor at the address below, on deposit of two guineas, returnable only on receipt of a bona fide tender and the return of all documents.

Tenders in sealed envelopes not bearing any mark indicating the name of the sender, but endorsed "Great North Road Lighting" must reach the undersigned not later than Saturday, 30 Oct., 1954.

The Council does not bind itself to accept the lowest or any tender.

O. R. MARSHALL,
Clerk to the Council.

Council Offices,
Adwick-le-Street, Nr. Doncaster.
27 Sept., 1954. (N 305)

COUNTY BOROUGH OF SWANSEA

TENDERS FOR PUBLIC LIGHTING EQUIPMENT

TENDERS are invited for the supply and delivery of the undermentioned Sodium Public Lighting Equipment.

1. Totally Enclosed Lanterns.
2. Auxiliary Gear.
3. Lamp brackets.

Forms of Tender and further particulars may be obtained from the Borough Engineer and Surveyor, The Guildhall, Swansea.

Tenders in envelopes sealed and endorsed "Tenders for Public Lighting Equipment," but which must not bear any name or mark indicating the sender, must be sent by registered post to the undersigned on or before Saturday, 30 Oct., 1954.

The Council does not bind itself to accept the lowest or any tender.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea.
9 Oct., 1954. (N 419)

CITY AND COUNTY BOROUGH OF BELFAST
Electricity Department

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (N.I.) 1954

TENDERS are invited for the supply, delivery and erection at the First and Second Extensions of Belfast Municipal Electric Power Station West of:

Extensions to Pneumatic Dust Removal and Surface Cleaning Installation, capable of removing 7·3 tons of grit and dust, etc. from hoppers and delivering to filter receiver units. The equipment represents additional units required to operate with existing plant as an integral unit and the exhauster, filter receiver, pipework and tools shall be designed to match up with

continued in next column

continued from previous column

the existing Installation and fit in with Form of Tender (N.1424), Conditions, the provision made to accommodate these extensions.

Specification and drawings in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Dust Handling Plant, Electricity Department" and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 18 Nov., 1954.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any Tender will not necessarily be accepted.

EYRE GORDON,
Chairman,
Northern Ireland Joint Electricity Committee.

Chichester House,
Chichester St,
Belfast.
8 Oct., 1954. (N 411)

HAZEL GROVE AND BRAMHALL URBAN DISTRICT COUNCIL

IMPROVED STREET LIGHTING ON TRUNK ROADS

TENDERS are invited for the supply and installation of reinforced concrete columns and brackets, steel columns and brackets, lanterns and accessories for improved lighting to Group A Standard by horizontal burning mercury vapour lighting equipment on:

(*a*) Buxton Rd, A.6. Hazel Grove (Approx. 1¼ miles).

(*b*) Macclesfield Rd, A.523. Hazel Grove (Approx. ¼ mile).

Drawings may be inspected, and specification of works, schedules of quantities and forms of tender obtained at the office of the Engineer and Surveyor (Mr J. Fleming Andrew, M.I.MUN.E.) at the Council House, Hazel Grove, on payment of a deposit of Two Guineas, returnable on receipt of a bona fide tender.

Tenders in plain sealed envelopes, endorsed "Tender for Street Lighting" must reach the undersigned at The Council House, Hazel Grove, not later than 16 Nov., 1954.

The lowest or any tender will not necessarily be accepted and the Council reserve the right to place separate Contracts for each installation.

F. E. CAPPER,
Clerk.
(N 429)

LLANDUDNO URBAN DISTRICT COUNCIL

STREET LIGHTING

SUBSTITUTION OF ELECTRIC FOR EXISTING GAS LIGHTING

TENDERS are invited for the supply, erection and wiring of concrete lighting columns complete with lanterns for 22 No. Class "A" and 136 No. Class "B" columns.

Specification and Bill of Quantities together with General Conditions of Contract and Form of Tender may be obtained from, and Drawings may be inspected at the Office of the Engineer and Surveyor, Town Hall, Llandudno.

Tenders in plain envelopes endorsed "Tender for Street Lighting" must be delivered to the undersigned not later than noon, on Friday, 29 Oct., 1954.

The Council do not bind themselves to accept the lowest or any tender.

REUBEN D. JONES,
Clerk to the Council.

Town Hall,
Llandudno.
29 Sept., 1954. (N 306)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

MORISTON PROJECT
ELECTRIC LIGHTING, SMALL POWER AND OTHER SUBSIDIARY SERVICES FOR CEANNACROC POWER STATION

TENDERS are invited for the above installation. Copies of the Tender Document may be obtained on application, with a cheque for £2. 2s. (returnable), to the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1.

The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Ter,
Edinburgh 3.
8 Oct., 1954. (N 412)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

HER MAJESTY'S COLONIAL SERVICE

ENGINEERS, POSTS AND TELEGRAPHS DEPARTMENT NIGERIA (BCD 108/14/05)

DUTIES include (*a*) the supervision of African and European staff, installing and maintaining several types of wireless equipment, particularly V.H.F. single and multi-channel, or (*b*) the supervision of staff and the installation and maintenance of manual telephone exchanges; the planning, installation and maintenance of associated subscribers networks, and the maintenance of carrier equipment and telegraphs used on physical or V.H.F. Radio Circuits, or (*c*) the carrying through of telephone subscriber underground cable development schemes including the balancing of loaded cables, and telecommunications duties of a general nature if necessary.

Appointment is either pensionable on probation in the salary range £910/£1,560 per annum gross or on contract in the salary range £1,116/£1,898 per annum gross with a gratuity of £150 per annum on satisfactory completion of contract. Free first class passages are provided for the officer, his wife, and assistanee of up to £75 each for a maximum of 2 children is granted in respect of their passages or maintenance in the United Kingdom. Leave is granted at the rate of 7 days for each month of resident service in tour of 18-24 months and government quarters are provided, if available, at low rental.

Candidates, between 25 and 35 years of age, must have passed, or be exempt from Parts A and B of the examination for A.M.I.E.E. or hold a University Degree in Electrical Engineering (preferably telecommunications) or be an Assistant Engineer in the British Post Office with considerable experience in modern telecommunications practice. Preference given to candidates with experience in the installation and maintenance of V.H.F. multi-channel equipment.

Further particulars and application forms from the Director of Recruitment (Colonial Service) Colonial Office, Great Smith St, London, S.W.1, quoting BCD 108/14/05/DIO. Closing date for receipt of initial enquiries, 6 Nov., 1954. (N 373)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 99/54

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER at Uskmouth Power Station. Salary Class K.10, £719/£750 per annum.

H.N.C. and experience in Power Station Control Room desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 29 Oct., 1954. (N 406)

LONDON ELECTRICITY BOARD

SENIOR DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Design and Planning Branch of the North Eastern Sub-Area at Stratford, E.15.

Applicants should have had training and experience in building construction and the design of steelwork and reinforced concrete structures, and be capable of preparing drawings and making calculations for the alteration of existing premises and the conversion into substations and transformer chambers. Experience in the layout of electrical equipment up to 11 kV, whilst not essential, would be an advantage.

The post is graded under Schedule "D" of the National Joint Board agreement as Senior Draughtsman, Grade 5—£595. 7s. to £704. 11s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 10 days of the publication of this advertisement. Please enclose addressed envelope and quote Ref.: V/1805/T. (N 403)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

GENERAL ASSISTANT ENGINEER required for Distribution work in North Caledonia Area. Salary N.J.B. Class F, Grade 11/9 (£548/£607) according to qualifications and experience. Superannuation Scheme applicable. Applications stating age, qualifications and experience to be forwarded to Area Manager, West Villa, Elgin, Morayshire, not later than 25 Oct., 1954. (N 420)

MID-ESSEX TECHNICAL COLLEGE AND SCHOOL OF ART
Market Road, Chelmsford

Principal: C. E. Preston,
M.B.E., M.ENG., M.I.E.E., M.I.MECH.E.

HEAD OF ENGINEERING DEPARTMENT

APPLICATIONS invited for post of Head of Engineering Department (Burnham Report Grade III). Salary £1,215 x £25 to £1,365 (man). Applicants should possess a good engineering degree and have had suitable industrial teaching and administrative experience. Further particulars and application form obtainable from the General Education Officer, County Offices, Chelmsford (stamped addressed foolscap envelope) and returnable by 25 Oct., 1954. (N 363)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

JUNIOR ENGINEER is required at Walsall Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A" of the Agreement, Grades G16 to G14, commencing at £402 per annum.

A sound general education and technical training is required and preferably some power station experience. Appropriate technical qualifications an advantage.

Apply quoting Vacancy No. 791MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 Oct., 1954. (N 402)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
Worthing District

SALARY £524 p.a. under N.J.B. Agreement, Class "E," Grade 11. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV.

Applications, naming 2 referees to M. J. Mortimer, M.I.E.E., District Manager, SEEBoard, 56 Chapel Rd, Worthing, Sussex, by 27 Oct., 1954.

A. L. BURNELL,
Secretary.
(N 409)

NIGERIAN PORTS AUTHORITY

VACANCIES FOR SENIOR EXECUTIVES

THE NIGERIAN PORTS AUTHORITY has vacancies for the following Senior Staff. The Authority was recently created as a Public Corporation and offers good prospects.

ASSISTANT CHIEF ENGINEER (MECHANICAL and ELECTRICAL) (M2A/40490/EE). Candidates should be corporate Members of the Institution of Mechanical Engineers and/or the Institution of Electrical Engineers and have wide experience with equipment normally associated with Port operating activities, including electrically operated units, diesel shunting locomotives and motor transport. Some knowledge of Telecommunications and R/T an advantage. Age 35-45. Salary commencing at £2,000 per annum, according to experience.

DEPOT SUPERINTENDENT (M2A/40491/EE) to take charge of central construction depot. Applicants should have had previous experience of similar duties in a contractors plant yard and be well versed in organisational requirements and the maintenance of records. Experience in "blackgang" fitting an advantage. Commencing salary £1,550 per annum. Age 35-40 years.

Appointments will be for one tour of 10 to 18 months in the first instance thereafter, subject to satisfactory service, employment will be offered on a permanent basis and officers will be required to join the authority's pension scheme or Provident Fund. It may be possible to preserve existing pension rights. Free first class return passages for officer and wife and assistance towards cost of up to two children's passages or an allowance in lieu thereof. Partly furnished quarters provided at rental of 10% of salary (max. £150 a year). Outfit allowance £60. Leave on full salary at rate of 7 days for each month's service. Free medical services. Car allowances payable and loans for car purchase in approved cases. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience quoting the reference number shown against the relevant post. (N 381)

COVENTRY CORPORATION

require ASSISTANT ELECTRICAL ENGINEER for Public Lighting Section, salary £550/£595 plus £26 Local Award in certain circumstances. Part 1 of I.E.E. Associate Membership examination or equivalent qualification, and experience with electrical contractor or local authority in design and carrying out lighting, power and heating installations essential. Street lighting experience an advantage. All officers expected to belong to appropriate organisation. Application forms from City Engineer, Council Hse, Coventry, returnable by 25 Oct. (N 407)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Aberdeen Area

APPLICATIONS are invited for two vacancies in the Aberdeen Power Station:

(1) MAINTENANCE ENGINEER (Electrical).

(2) ASSISTANT MAINTENANCE ENGINEER (Electrical).

Salary will be in accordance with N.J.B. Agreement, Class F, Grade 6, and Grade 8, and the posts are superannuable.

Applications should reach the undersigned by 22 Oct., 1954, giving personal details of age, operation and maintenance experience of power station plant and/or experience in Manufacturers' Works, and technical education and qualifications.

Applications already received for the original vacancy will still be considered for the additional position now being advertised.

J. E. WHITTAKER,
Area Manager.

Area Offices,
Millburn St, Aberdeen. (N 343)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

GENERAL ASSISTANT ENGINEER (COMMUNICATIONS)
METERS TESTING AND PROTECTION

APPLICANTS should have had a wide experience in planning, installing and maintaining line tele-communication and remote control systems, and in the maintaining of radio telephone communication equipment. A knowledge of protective relays and systems will be an advantage.

Salary—N.J.B. Class N, Grade 13, £692/£716 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 28 Oct., 1954.

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

Applicants must hold at least the Higher National Certificate in Electrical Engineering and should preferably be Graduates of the Institution of Electrical Engineers. They should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Salary—N.J.B. Class H, Grade 10, £641/£667 per annum.

Gainsborough District
INSTALLATION ENGINEER

The person appointed will be responsible for the organisation and administration of the contracting section including the supervision of manual workers. He must be capable of preparing specifications and estimates and supervising schemes for complete installations of all types and must have a thorough knowledge of the Electricity Supply Regulations and the I.E.E. Regulations for the Electrical Equipment of Buildings. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Salary—N.J.B. Class D, Grade 8, £592/£610 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 28 Oct., 1954. (N 395)

BRITISH ELECTRICITY AUTHORITY
South-Eastern Division

ASSISTANT ENGINEER (HANDLING)
BRIGHTON "A" AND "B" POWER STATIONS

APPLICATIONS are invited for an engineer of proved engineering training, combined with organising and administrative abilities, to control all coaling plant, external ash removal plant, berthing and movement of ships at the jetty, for a plant handling 700,000/900,000 tons of coal per annum. Superannuable appointment.

N.J.B. Conditions of Service. Salary £667/£692 p.a. Class L, Grade 12. Applications giving details of education, present position, experience, etc., should be received by the Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, by 5 Nov. (N 390)

GLOUCESTERSHIRE COUNTY COUNCIL

ELECTRICAL ENGINEERING ASSISTANTS, should hold National Certificate of Electrical Engineering or have passed Section "A" of I.E.E. Examination, Grade IV (£580/£625), also posts in Grade III (£550/£595) according to qualifications and experience. N.J.C. Conditions of Service. Medical Examination. Motor Car licence.

Apply giving age, present position, salary and date appointment, previous appointments, names and addresses two persons for references, County Architect, Shire Hall, Gloucester, by 21 Oct., 1954.

GUY H. DAVIS,
Clerk of the County Council.
(N 379)

LONDON ELECTRICITY BOARD
ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the above positions in the District Drawing Offices of the Southern Sub-Area. The successful candidates will be located initially at Beckenham, Kent.

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, obtaining and recording all mains work, and plant layout in transformer chambers.

The posts are graded under Schedule "D" of the National Joint Board agreement as Grade 6—£458 to £595. 7s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed by 31 Oct., 1954. Please enclose addressed envelope and quote Ref.: V/1828/1749/T. (N 404)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) SHIFT CHARGE ENGINEER at Ironbridge Power Station, Grade H7, commencing at £772 per annum. (Vacancy No. 782MD.)

(*b*) SHIFT CHARGE ENGINEER at Stoke Power Station, Grade E7, commencing at £649 per annum. (Vacancy No. 783MD.)

(*c*) ASSISTANT SHIFT CHARGE ENGINEER at Walsall Power Station, Grade G9, commencing at £641 per annum. The station will be shortly reclassified Class H. (Vacancy No. 784MD.)

(*d*) ASSISTANT SHIFT CHARGE ENGINEER at Ocker Hill Power Station, Grade F9, commencing at £607 per annum. (Vacancy No. 785MD.)

(*e*) MAINTENANCE ENGINEER (Electrical) at Stoke Power Station, Grade E6, commencing at £699 per annum. (Vacancy No. 786MD).

(*f*) ASSISTANT ENGINEER at Hams Hall "B" Power Station, Grade K12, commencing at £631 per annum. (Vacancy No. 787MD.)

(*g*) JUNIOR ENGINEER at Nechells "B" Power Station, Grades J18 to 14, salary range £402 to £545 per annum. (Vacancy No. 788MD.)

Applicants for these positions should have received sound technical training and power station practical experience in particular for (*a*), (*b*), (*c*) and (*d*) in the operation and maintenance of steam generating plant and main switchgear, including for (*a*) pulverised fuel-fired boilers. For (*e*) a thorough knowledge of power station electrical maintenance is required and for (*f*) applicants should preferably have had experience in the control of the works supply system. Appropriate technical qualifications an advantage.

Apply, quoting the Vacancy Number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 Oct., 1954. (N 408)

MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT DISTRICT ENGINEER required in the Evesham District of the Worcester and District Sub-Area. Experience necessary in all branches of distribution work, including operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable.

Salary £524/£540 per annum (N.J.B. Class E, Grade 11). Superannuable.

Apply, in writing, within 14 days, stating age, experience and present position to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
(N 413)

BRITISH ELECTRICITY AUTHORITY
South Western Division

TECHNICAL STAFF VACANCIES

(*a*) GENERAL ASSISTANT ENGINEER —Technical Department (Plymouth Region), N.J.B. "AX/CX," Grade 8, £501/£675.

(*b*) STATION SHIFT CONTROL ENGINEER — Exeter Generating Station. N.J.B. "D" 10, £531/£547.

Candidates for (*a*) should possess qualifications leading to A.M.I.E.E. and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design and generator and switchgear testing.

For (*b*) should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 25 Oct., 1954. (N 399)

THE EAST MIDLANDS ELECTRICITY BOARD
GENERAL ASSISTANT ENGINEER
MATLOCK DISTRICT

APPLICATIONS are invited for the position of General Assistant Engineer in the Bakewell Section of the Matlock District.

The appointment will be in accordance with Class "E," Grade 9 (£587/£600) of the Agreement. Candidates should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification, have experience in the construction, operation and maintenance of a 33 kV, 11 kV and L.V. underground and overhead system and be prepared to reside within the District. The successful applicant should be mobile and will be required to undertake standby duties.

Applications, giving details of age, qualification, experience and training should be sent to the Manager, Matlock District, Knowleston Place, Matlock, to reach him not later than 26 Oct., 1954. (N 398)

THE NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER, NEW MILLS

APPLICANTS should have had experience in planning and estimating of schemes and operation and maintenance of both overhead and underground networks at voltages up to 33 kV. Possession of H.N.C. or equivalent with practical experience of overhead line construction is desirable. The successful candidate will be expected to undertake standby duties.

Salary Scale: £649/£681 p.a. Grade "E" 7. N.J.B. Conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel St, Hazel Grove, Cheshire, and must be returned to him by 30 Oct., 1954. (N 397)

NORTH EASTERN ELECTRICITY BOARD
HEAD OF WAYLEAVES AND AGREEMENTS SECTION

APPLICATIONS are invited for the above appointment in the Secretary's Department at Area Board Headquarters, Newcastle-upon-Tyne. The Section is responsible for wayleaves, estates, insurances and agreements. Applicants should have had practical experience of property and wayleave negotiations and of administrative matters relating thereto, preferably within the Electricity Supply Industry. Some knowledge of insurance and of agreement recording procedure is desirable. Salary and conditions of service in accordance with N.J.M.H.E. Agreement. Salary—Scale 3, £1,450/£1,600. The post is superannuable.

Applications, stating age, qualifications and experience, should be marked "confidential" and forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol Hse, Newcastle-upon-Tyne, to arrive not later than 30 Oct., 1954. (N 401)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (INSTRUMENTS)
BRUNSWICK WHARF GENERATING STATION
Vacancy No. 54/855

Experience of all types of instruments necessary with experience of Automatic Boiler Control equipment an advantage. Salary—Class K, Grade 14=£582. 15s. p.a.

SHIFT CHARGE ENGINEER
WIMBLEDON GENERATING STATION
Vacancy No. 54/856

Sound technical training and practical experience in the operation of steam generating plant and main switchgear necessary. Salary—Class E, Grade 7=£681. 9s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St. W.1, and be received within 14 days of this advertisement. (N 396)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Norfolk Sub-Area

Norwich District
145/54.R
DISTRICT COMMERCIAL ENGINEER

Candidates should have had a sound engineering training and wide experience of all commercial activities of the Electricity Supply Industry. Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary in accordance with Class F, Grade 4 of the National Joint Board Salary Agreement commencing at £850.

Apply to the Manager, Norfolk Sub-Area, Eastern Electricity Board, 4 Duke St, Norwich, Norfolk.

Northmet Sub-Area

Sub-Area Headquarters, Southgate, London, N.14.
148/54.R
ENGINEERING DRAUGHTSMEN

The duties include layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

Salary in accordance with Grade 6, Schedule D of the National Joint Board Salary Agreement within a range of £433/£567 plus London Allowance.

Apply to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London, N.14.

Bishop's Stortford District
(1) SENIOR SALES REPRESENTATIVE
147/54.N
(2) 3RD ASSISTANT ENGINEER
151/54.R

For post (1) the duties will consist of giving advice on supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations.

Salary in accordance with Grade 2 (£485 by £20—£545) of the National Joint Council Salary Agreement.

For post (2) candidates should have had a sound training in electrical engineering and experience in the construction, operation and maintenance of underground and overhead systems.

Salary in accordance with Class D, Grade 9 of the National Joint Board Salary Agreement commencing at £561.

Apply to the District Manager, Eastern Electricity Board, 25 North St, Bishop's Stortford, Herts.

JUNIOR ENGINEERS

Required in the following localities:
(1) Northmet Sub-Area Headquarters
150/54.R
(2) Enfield District, Northmet Sub-Area
149/54.R

continued in next column

continued from previous column

(3) Bishop's Stortford District, Northmet Sub-Area
152/54.R

Candidates should have had a good general and technical education and possess the Higher National Certificate in electrical engineering or an equivalent qualification. For post (1) previous experience in a planning and development office would be an advantage.

Salary in accordance with the National Joint Board Salary Agreement as follows:
(1) Class N, Grades 22-18 within a range of £402/£544 plus London Allowance.
(2) Class F, Grade 15 at £402 plus London Allowance.
(3) Class D, Grade 14 at £423.

Apply as follows:
(1) The Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London, N.14.
(2) The District Manager, Eastern Electricity Board, 40 Church St, Enfield, Middlesex.
(3) The District Manager, Eastern Electricity Board, 25 North St, Bishop's Stortford, Herts.

Future salary and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications, and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (N 405)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

BOILER HOUSE SHIFT CHARGE ENGINEER
NORTH WILFORD POWER STATION, NOTTINGHAM
Vacancy No. 155/54/ET

Applicants should have had a sound technical training, a good general engineering experience and a knowledge of the control and operation of large pulverised fuel boilers and associated equipment. Preference will be given to candidates who are in possession of technical qualifications admitting to Corporate Membership of a recognised professional Institution.

Salary in accordance with Class K, Grade 9 (£766/£796 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Oct., 1954.

SHIFT CHARGE ENGINEER
BURTON ON TRENT POWER STATION
Vacancy No. 156/54/ET

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear is required. Appropriate qualifications an advantage.

Salary in accordance with Grade E, Class 7 (£649/£681 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25 Oct., 1954.

SECOND ASSISTANT CHEMIST
LINCOLN POWER STATION
Vacancy No. 157/54/ET

Preference will be given to candidates who hold the Higher National Certificate in Chemistry, but holders of the Ordinary National Certificate in Chemistry will be considered.

The salary will be in accordance with Class E, Grade 11 (£524/£540 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1 Nov., 1954.

SENIOR DRAUGHTSMAN (ELECTRICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 114/54/ET

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables:

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knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement, Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D according to experience.

Closing date for receipt of applications, 1 Nov., 1954.

THIRD ASSISTANT ENGINEER
DIVISIONAL HEADQUARTERS
Vacancy No. 158/54/ET

Applicants should hold a degree in Civil Engineering, be Corporate Members of the Institution of Civil Engineers or possess equivalent qualifications.

They should have had experience in the design and construction of heavy foundations, river works, structures in reinforced concrete and steel and other civil engineering works associated with the design and construction of Power Stations.

Experience in the preparation of specifications, bills of quantities and estimates will be an advantage.

The salary for the appointment will be within Schedule C, Class AX/DX, Grade 5 (£649/£858 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 1 Nov.,1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
8 Oct., 1954. (N 400)

DUDLEY AND STAFFORDSHIRE TECHNICAL COLLEGE

APPLICATIONS are invited for the post of ASSISTANT LECTURER in Electrical Engineering. Applicants must have had adequate industrial experience, and must be professionally qualified. Duties will begin on 1 Jan., 1955. Salary on Grade A of the Burnham Technical Report (£450 x £18—£725) with allowances, where appropriate, for graduate qualifications, training and experience.

Application forms and further particulars may be obtained from the Principal, Dudley and Staffordshire Technical College, Dudley, to whom the completed forms must be returned as soon as possible.

A. W. GIBSON,
Principal.
(N 423)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

LITTLEBROOK POWER STATION. ASSISTANT ENGINEER (Electrical Testing). Applicants will be judged on initiative and potentiality and should have a sound technical and practical knowledge of the testing of electrical plant, protective and control gear associated with a modern Power Station. Class M, Grade 15, £617. 8s. per annum, including London Allowance.

MAIDSTONE POWER STATION. STATION SHIFT CONTROL ENGINEER. Applicants should have had a sound technical education and experience in the operation of turbo-generators and Control Room duties. Class C, Grade 10, £502 per annum.

N.J.B. Conditions of Service for both positions.

Applications giving details of education, present position, experience, etc., should be received by the Station Superintendent at either Littlebrook Power Station nr. Dartford, Kent, or Power Station, Fairmeadow, Maidstone, Kent, according to the location of the vacancy, by 30 Oct. (N 428)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

APPLICATIONS are invited for the following appointments:

SENIOR DRAUGHTSMAN (CIVIL)
Generation Construction Department, Sheffield

Salary £567/£671 per annum. Grade 5, Schedule D, National Joint Board Agreement.

Applicants should have a Higher National Certificate or equivalent qualification and be experienced in designing or detailing reinforced concrete structures, structural steelwork or general building construction such as are associated with heavy industrial work.

JUNIOR ASSISTANT CHEMIST
Thornhill Power Station
Near Dewsbury

Salary £402/£491 per annum. Class G, Grades 16-14, National Joint Board Agreement.

Candidates should preferably hold a Higher National Certificate in Chemistry and have had previous laboratory experience associated with the testing and analysis of fuels, waters and oils.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(N 427)

BRITISH ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for the appointment of a THIRD ASSISTANT ENGINEER (Construction) in the Transmission Department at Divisional Headquarters, Newcastle upon Tyne.

Applicants should have had considerable experience in the layout and construction of high voltage transmission systems, together with substation and associated equipment. Applicants should preferably be corporate members of the Institution of Electrical Engineers or hold equivalent qualifications.

The salary for the appointment (which is superannuable) will be in accordance with Grade 5, Schedule "C," of the National Joint Board Agreement (£649/£835) per annum and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 26 Oct., 1954.
(N 380)

A WELL-KNOWN firm of switchgear and control gear manufacturers in South-West Scotland have the following vacancies:

1. ENGINEER to handle airbreak hand and automatic switch and control gear tenders and contracts.
2. DRAUGHTSMAN for work on medium voltage airbreak circuit-breaker and contactor equipment and circuit diagrams.

National Certificate and workshop experience an advantage. Good conditions, high rates, pension scheme. Apply giving age, experience, technical training and salary to —Box No. 3923, Electrical Times. (N 418)

AN opportunity occurs in progressive manufacturing concern in London area for ENGINEER aged 25/35 with electrical or physicist degree, on development and research work on high frequency, telecommunication cable and associated testing equipment. Salary will be commensurate with qualifications and experience. Apply giving full particulars to—Box No. 3893, Electrical Times. (N 324)

ASSISTANT required for Contracts Dept. handling Works Specifications, etc., technically and commercially. Ordinary or Higher National Certificate (Electrical) standard necessary. Apply stating experience, etc., salary, to Evershed and Vignoles Ltd., Acton Lane Works, Chiswick, W.4. (N 382)

APPLICATIONS are invited for RADIO AND TELEVISION SALESMAN-MECHANIC. Applicants must be able to service and maintain all types of Radio and TV sets, and must possess qualifications of the recognised Trade bodies. No house available. Applications, in writing, stating age, experience, wages required (no overtime paid) with copies of recent testimonials to be sent to General Manager, Musselburgh and Fisherrow Co-operative Society Ltd., Musselburgh, not later than Monday, 25 Oct., 1954. (N 430)

APPLICATIONS are invited by The General Electric Co., Ltd., from YOUNG MEN who are interested in joining their Sales organisation in London and the Provinces. Applicants should not be over 30 years of age and have had previous experience in the selling of electrical equipment. Preference will be given to those having taken studies in electrical engineering. The positions offer good opportunities to show initiative and drive, also for advancement. Apply in writing, giving full details to the Staff Manager, Magnet Hse, Kingsway, W.C.2. (N 415)

ASSISTANT ELECTRICAL ENGINEERS required with experience in design of electrical installations for Houses, Flats, Hospitals, Schools, Heavy Industrial Plants, Medium and High Voltage Distribution Systems, Substation Layouts, etc. Progressive appointments. Five-day week. Write, giving details of age, experience and training, to George Wimpey and Co., Ltd. (B. W. Sharpley), 27 Hammersmith Grove, London, W.6. (N 421)

BUYER, male or female, for Electric Control Gear Works in South-East London. Must have experience of small electro-mechanical apparatus, stock control, etc. Reply stating age, experience and salary required, to—Box No. 3891, Electrical Times. (N 311)

CABLE ENGINEER of some calibre 30 to 40, experienced estimating, testing and manufacture of flexible cables required as assistant to Managing Director. Good salary and prospects for the right man—Superannuation Pension Scheme—old-established small company, S.E. London.—Write, in confidence, stating qualifications and present salary, to Director—Box No. 3913, Electrical Times. (N 392)

CONTRACT ENGINEER required by Bruce Peebles and Co., Ltd., Edinburgh, for their Hydro-Electric Section. Applications are invited from engineers with experience in handling comprehensive contracts and also from young engineers with good engineering background, technical education up to H.N.C. standard and who have completed their National Service. Apply to Mr V. P. Mackay, "R" Department Manager, at the above address. (N 356)

DESIGN ENGINEER for power rectifiers is required by a large manufacturing organisation in the Midlands, for work of exceptional technical interest with good prospects. No previous rectifier experience is necessary, but candidates should have degree and some practical training. Excellent residential and educational district. Please write with full details to Box No. 1364, T. and G., 167 High Holborn, London, W.C.1. (N 329)

DRAUGHTSMEN with sound experience in the design of High Voltage Isolating Switches and Fuses 11,000 V and above. Very good prospects for fully-trained draughtsmen. Write giving particulars of experience, age and salary required to—Box No. 3915, Electrical Times. (N 393)

Draughtsmen

required for Automatic Electric Control Gear; 5-day week; excellent working conditions; Canteen facilities; convenient transport; Incentive Bonus; Superannuation Scheme; salary according to qualifications, ability and experience. Apply Asst. Sec.: Watford Electric and Mfg. Co., Ltd., Watford, Herts. (N 385p)

Required
ELECTRICAL AND RADIO DRAUGHTSMEN
Apply to
Employment Manager,
Vickers-Armstrongs Limited
(Aircraft Division)
Hurn Airport Nr. Christchurch, Hants.

DRAUGHTSMAN required immediately for Instrumentation work in connection with important Government Contracts. National Certificate an advantage but not essential. Excellent conditions. 5-day week. Apply to General Manager, Hendrey Relays Ltd., 392 Bath Rd, Slough, Bucks. (N 416)

DRAUGHTSMAN required with experience of metalclad medium voltage switchgear. Unfurnished house available. A.E.S.D. rate minimum. Reply stating age and experience to Ottermill Switchgear Ltd., Ottery St. Mary, Devon. (N 351)

DRAUGHTSMAN required (Victoria Area) for Manufacture of L.T. Switchgear and General engineering. Prospects for man with initiative. Write age, experience and salary required.—Box No. 3921, Electrical Times. (N 417)

ELECTRICAL DRAUGHTSMAN required by Glasgow firm of Engineers for new development project. Five-day week, canteen and superannuation scheme in operation. Written applications desired in the first instance outlining technical education (which should be to at least O.N.C. standard), previous drawing office experience and salary required. Write 2992, Wm. Porteous and Co., Glasgow. (N 321)

ELECTRICAL DRAUGHTSMEN required, with experience in detailing and taking off materials, with minimum of supervision, for electrical installations for one or more of the following: Houses, Flats, Schools, Heavy Industrial Plants, Medium and High Voltage Distribution Systems, Substations, etc. Progressive appointments. Five-day week. Write, giving details of age, experience and training, to George Wimpey and Co., Ltd. (B. W. Sharpley), 27 Hammersmith Grove, London, W.6. (N 422)

ELECTRICAL/ELECTRONIC ENGINEER required to take charge of small laboratory. Applicant must have some years' experience in laboratory of manufacturers or large scale users of any of the following: Cables, Capacitors or insulation materials. Maximum age 35. Address London, E.11. Write fullest particulars.—Box No. 3879, Electrical Times. (N 278)

ELECTRICAL ENGINEER, fully qualified, with extensive experience in the installation of electrical equipment, transformers, switchgear and cables up to 11 kV pressure for heavy industrial equipment preferably as associated with Iron and Steelworks plant, required by Consulting Engineers for 4 year contract on major extensions to iron and steel plant in West Bengal, India. Reply to—Box No. 3911, Electrical Times. (N 386)

ELECTRICAL RESEARCH AND TESTING ENGINEERS

A. REYROLLE AND CO. have a number of vacancies for electrical engineers to be engaged on RESEARCH or other technical work in connection with switchgear, protective gear, insulation, etc. For certain of the vacancies an Honours or Pass Degree is required; for the others a Higher National Certificate is adequate and there is good scope for advancement. Starting salaries in accordance with age, technical qualifications and experience. Apply with full particulars to the Chief Engineer, A. Reyrolle and Co., Ltd., Hebburn, Co. Durham. (N 384p)

DOMESTIC APPLIANCE ENGINEERS

THE ENGLISH ELECTRIC COMPANY has always been eager to expand its Domestic Appliance Division. The first step in such a plan is the expansion of the Engineering Department by promotion from within the Company. In addition the Chief Engineer seeks to recruit two or three well qualified and experienced engineers to act as spearheads for this expansion at the Liverpool works.

These appointments carry complete responsibility for the design and development of entirely new appliances. In addition to technical qualifications, successful applicants must possess in full measure the qualities of management (initiative, drive and leadership) so that they may be eligible for consideration, as expansion proceeds, for the highest managerial positions in the division. Reply to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 452J. (N 375p)

ELECTRIC LAMP MANUFACTURERS (ELMA) require SELLING AGENTS (commission basis only) for all types of electric lamps including Mercury and Sodium. Applicants should be well established with Electricity Boards and other Nationalised Industries, Industrial Users and Wholesalers. Apply with fullest details of experience including Agencies held. Areas available (*a*) Scotland, (*b*) Lancashire, (*c*) Yorkshire, (*d*) East Midlands, (*e*) South Wales, (*f*) Southern Counties.—Box No. 3909, Electrical Times. (N 376)

ENGINEERS required for maintenance and design of electronic test equipment, quality control and investigational work on thermionic valves. INTER B.SC., or Higher National Certificate standard. Apply, giving full particulars of age, qualifications and experience, to Personnel Superintendent, The Edison Swan Electric Co., Ltd., Cosmos Works, Brimsdown, Enfield, Middlesex. (N 378)

ELECTRICAL SUPERINTENDENT, 35 to 45 years of age, required for large general engineering works in the East Midlands.

Experience of general works electrical maintenance essential, also, ability to handle labour. Pension Scheme in operation.

Applications giving age and full details of experience, qualifications and salary desired to—Box No. 3903, Electrical Times. (N 368)

JOHNSON AND PHILLIPS LTD. have vacancies for DRAUGHTSMEN in their

(*a*) Junction Box Dept.
(*b*) Contract Dept.

Applicants in the case of (*a*) should have experience in Cable Boxes and Accessories and in regard to (*b*) experience in Overhead Lines, Wood Poles, Steel Towers, etc. Applicants giving particulars of age, experience and salary expected, to Employment Manager, Johnson and Phillips Ltd., Victoria Way, Charlton, S.E.7. (N 232)

SIMPLEX ELECTRIC CO., LTD.
Development Department
APPOINTMENT OF DEVELOPMENT ENGINEER

Applications are invited for the position of senior engineer in the Development Department at Creda Works, Blythe Bridge, near Stoke-on-Trent, for work on Creda cookers and associated products. This is a position of considerable responsibility and carries an appropriate salary.

Applications in writing giving full details of qualifications and experience should be addressed to The Secretary, Simplex Electric Co., Ltd., Oldbury, Birmingham. (N 366 p)

BRUCE PEEBLES & CO. LTD.
Engineers, Edinburgh 5.

Applications are invited for a SENIOR ELECTRICAL DIAGRAM DRAUGHTSMAN experienced in the preparation of Transformer On Load Gear Control Schemes. Experience in the design of Control Panels and Marshalling Kiosks would be an advantage but not essential. Salary commensurate with experience. Candidates should apply giving full details of previous experience, to Mr R. W. Flux, Manager, Transformer Department, at the above address. (N 297p)

JUNIOR DESIGNERS required to deal with small transformers, power, audio, pulse, etc. Specialised training will be given to engineers with suitable basic training and experience. Applications to Technical Director, Gresham Transformers Ltd., Twickenham Rd, Hanworth, Middx. (N 275)

LABORATORY ENGINEER, H.N.C. or equivalent. Experienced Magnetic Amplifiers and control circuits. Housing and Pension Scheme available. Apply Personnel Manager, Electro Methods Ltd., Caxton Way, Stevenage, Herts. (N 391)

MONSANTO CHEMICALS LIMITED have a vacancy for an ELECTRICAL ENGINEERING ASSISTANT in the Engineering Department London. Applicants should preferably be a University Graduate and/or a Graduate of the Institution of Electrical Engineers. Age 23/28. The successful candidate will be engaged on the design and development of electrical equipment and installations in chemical plant. The post also entails the co-ordination of chemical and mechanical engineering work. A good salary, commensurate with qualifications and experience is offered, and the position is permanent and pensionable. Apply in writing, giving full details of age, education, training and experience to the Chief Personnel Officer, Monsanto Chemicals Limited, 8 Waterloo Place, London, S.W.1. (N 374)

MAINTENANCE ELECTRICIANS required for large Paper Mill. Sound experience of large A.C. and D.C. motors and switchgear essential. Bowater's Thames Paper Mills Limited, Northfleet, Gravesend, Kent. (N 254)

RADIO ELECTRICIAN with knowledge of auto electrical work required, apply Standard Distributors, Messrs John Kaye (Leeds) Ltd., New York Rd, Leeds 2. (N 414)

REPRESENTATIVES with established connections amongst Electrical Retailers required. Commission basis.—Box No. 3899, Electrical Times. (N 362)

REQUIRED in Monmouthshire an ELECTRICAL ENGINEER to take charge and be responsible for the running, upkeep and maintenance of electrical power plant, electrically driven excavators and drilling machines. Long term Contract. Apply—Box No. 3895, Electrical Times. (N 358)

SENIOR TRANSFORMER DESIGNER required with experience of all types of transformers up to 3,000 kVA. Excellent prospects for an energetic man capable of supervising junior engineers. Excellent working conditions, Pension Scheme, Canteen, etc. West London area. Applications to—Box No. 3877, Electrical Times. (N 277)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

Wanted by
LANCASHIRE FIRM
Keen
YOUNG MAN

with experience on most types of A.C. and D.C. Motors and Generators, preferably with both manufacturing and repair shop experience, and with test room experience on fractional, small, and medium H.P. machines. A man with an interest in developing into the design field is preferred. This vacancy offers considerable prospects for the right type of applicant.

Box No. 3897
Electrical Times (N 359p)

SENIOR ELECTRICAL DRAUGHTSMAN. Cathodic corrosion control can offer a permanent appointment to a senior electrical draughtsman in their London office. Education to Higher National preferred. Salary according to experience. Apply in writing to Personnel Manager, Costain-John Brown Ltd., 73 South Audley St, London, W.1. (N 361)

TECHNICAL ENGINEER (ELECTRICAL) required by Glasgow firm of Manufacturing Engineers to assist in design and development work on an important new project. Applicants should be honours graduates in electrical engineering with a few years' post graduate industrial experience. Written applications are desired in the first instance outlining technical education, qualifications and experience and approximate starting salary required. A superannuation scheme is operated. Write 2993, Wm. Porteous and Co., Glasgow. (N 322)

TRACER (female) wanted for Electrical Engineering Design Office in Central London. Preference to girl used to making tracings of complicated electrical diagrams. Applicants should be between 20 and 30 years old. Five-day week; superannuation scheme. Salary according to experience. Successful applicant would have to be passed by Company's Medical Officer. All applications will be treated in strictest confidence and should be addressed to Personnel Dept. (I.M.E.), Unilever Ltd., Unilever House, Blackfriars, London, E.C.4. (N 383)

TRANSFORMER DRAUGHTSMAN for all types up to 500 kVA for rapidly expanding company in Surrey. Situation offers excellent opportunity for advancement. Good commencing salary. House could be arranged. Reply in confidence.—Box No. 3881, Electrical Times. (N 279)

TRANSFORMER DRAUGHTSMEN required, fully experienced up to 2,000 kVA 66 kV, 5-day week, pension scheme. Apply to: Chief Mechanical Engineer, Hackbridge and Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey, giving details of experience and salary required. (N 320)

THE GENERAL ELECTRIC COMPANY LIMITED

have a number of vacancies at their Fraser and Chalmers Works for both

ELECTRICAL AND MECHANICAL ENGINEERS

aged 28 to 40, preferably with an Engineering degree or its equivalent for development work in connection with Nuclear Power Stations.

Apply giving particulars of training and experience to

Personnel Manager,
Fraser and Chalmers Engineering Works,
Erith, Kent (N 296p)

APPOINTMENTS WANTED

NAVAL ELECTRICAL OFFICER, 29 years of age, married, and available shortly, seeks progressive position in any part of the world, preferably Far East. Experience of A.C. and D.C. motors and control schemes from F.H.P. to 200 h.p. also propulsion equipment of 6,000 n.h.p. and auxiliaries.—Box No. 3883, Electrical Times. (N 280)

WANTED

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (N 11)

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (N 10)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd. 176 Brady St, Bethnal Green, E.1. (N 9)

WORK WANTED

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (N 13)

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (N 12)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (N 14)

AGENCIES

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Breams Buildings, London, E.C.4. Membership available to established agents only. Particulars supplied. (N 388)

FOR SALE

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Secretary.
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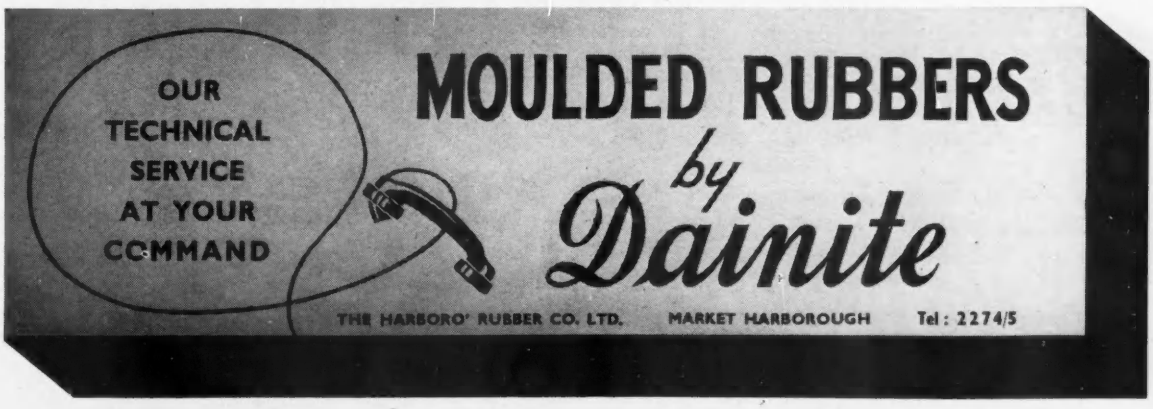

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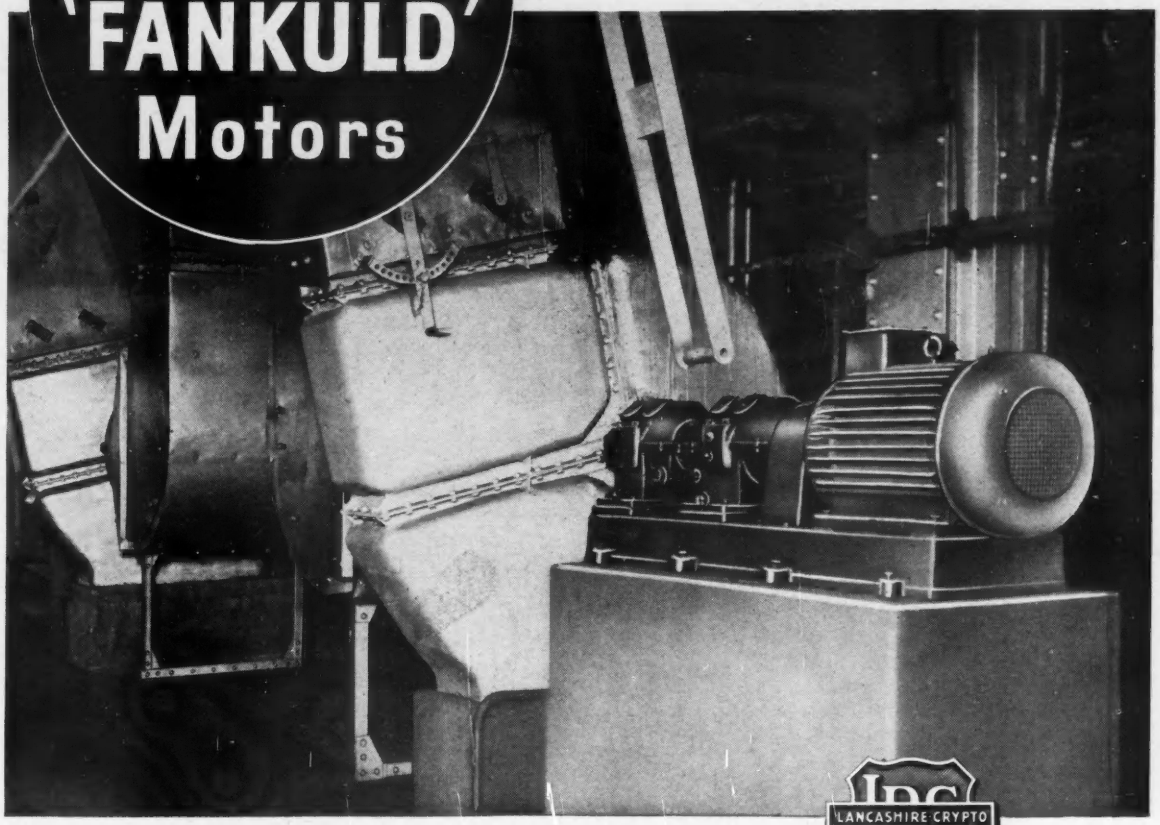

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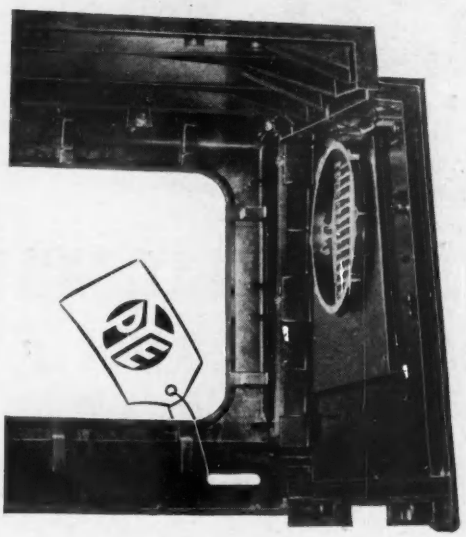

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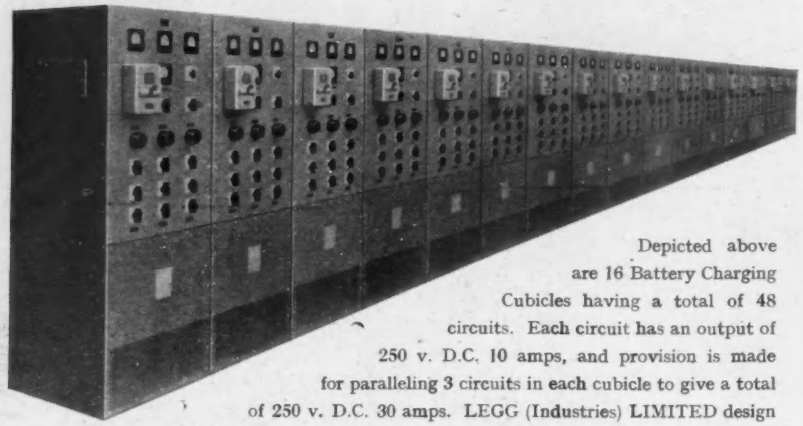

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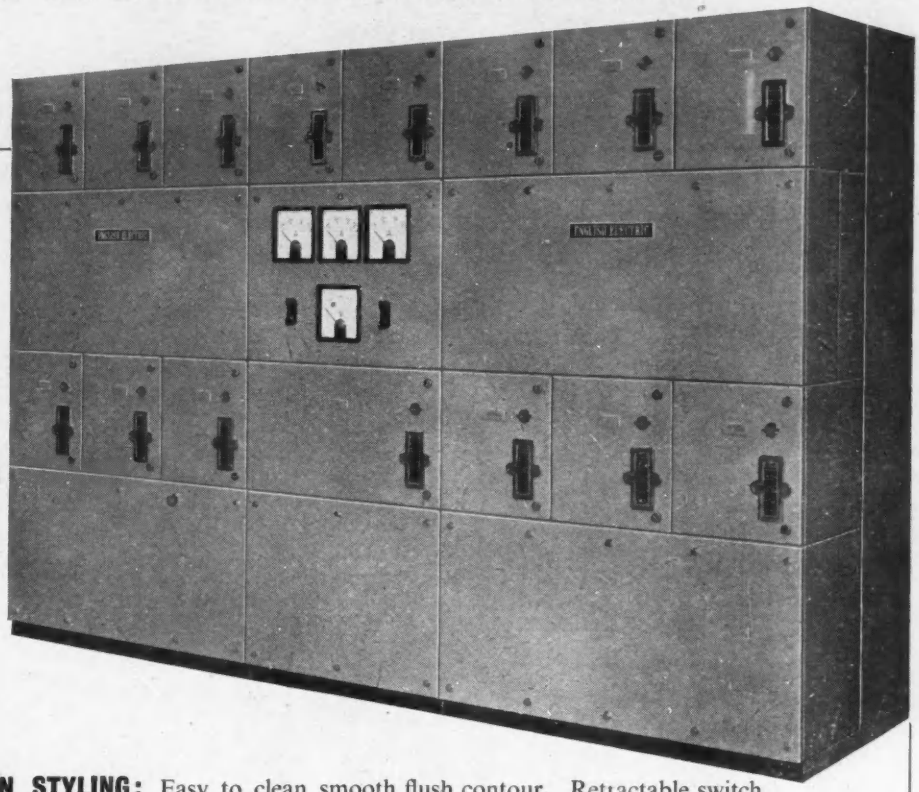

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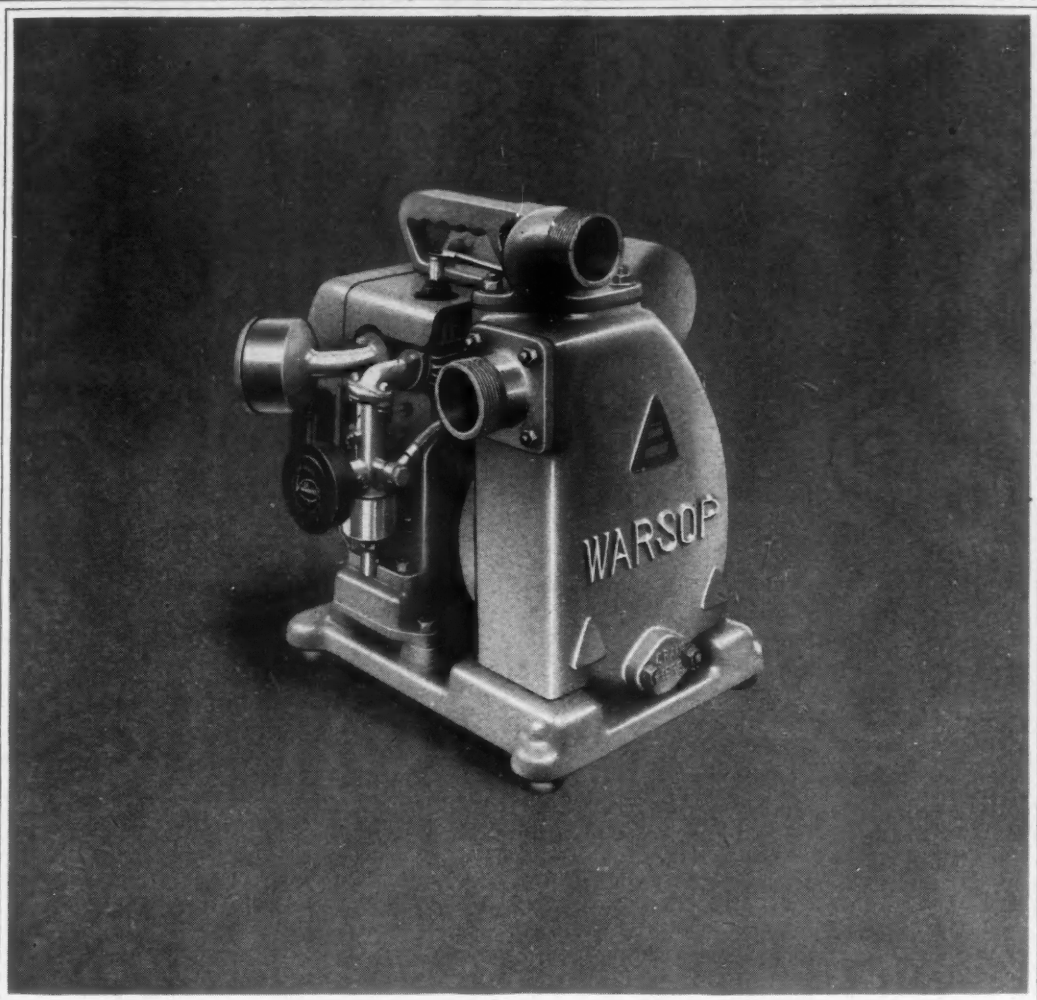

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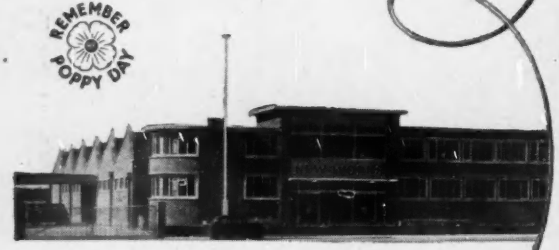

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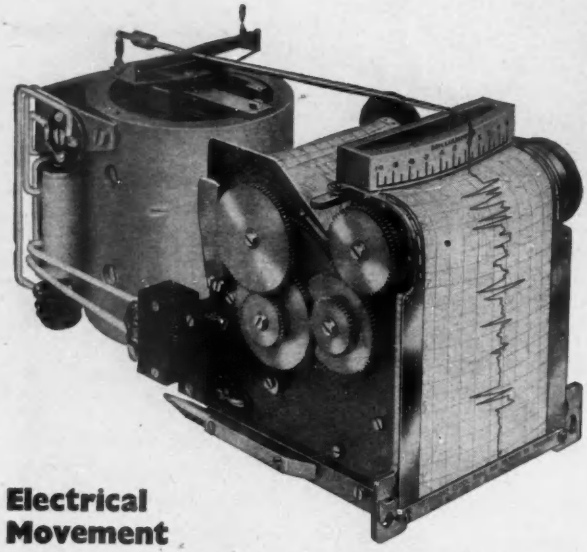

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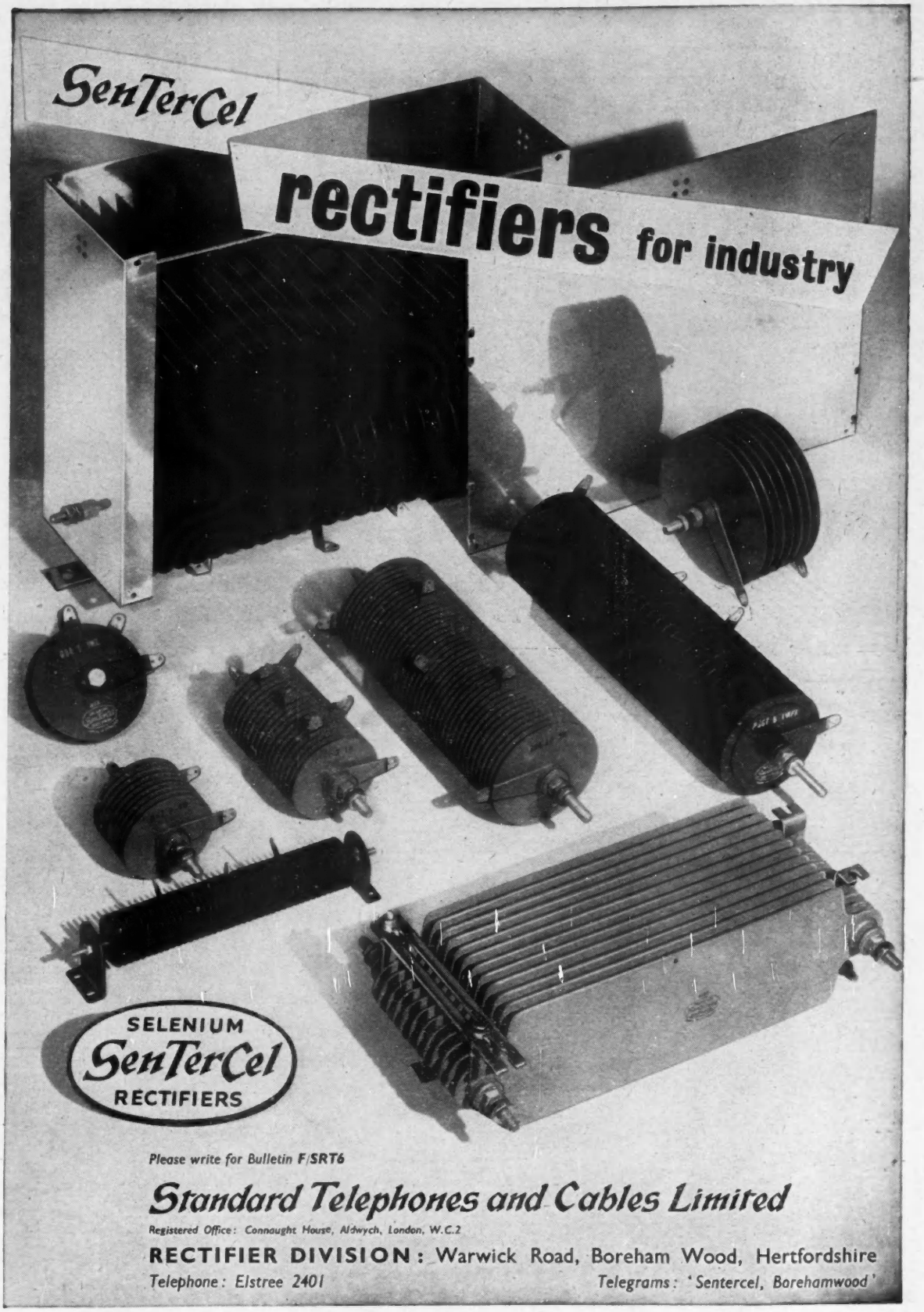

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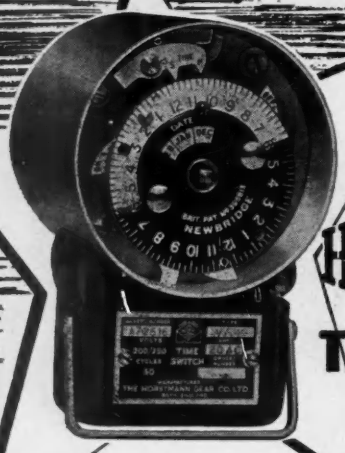

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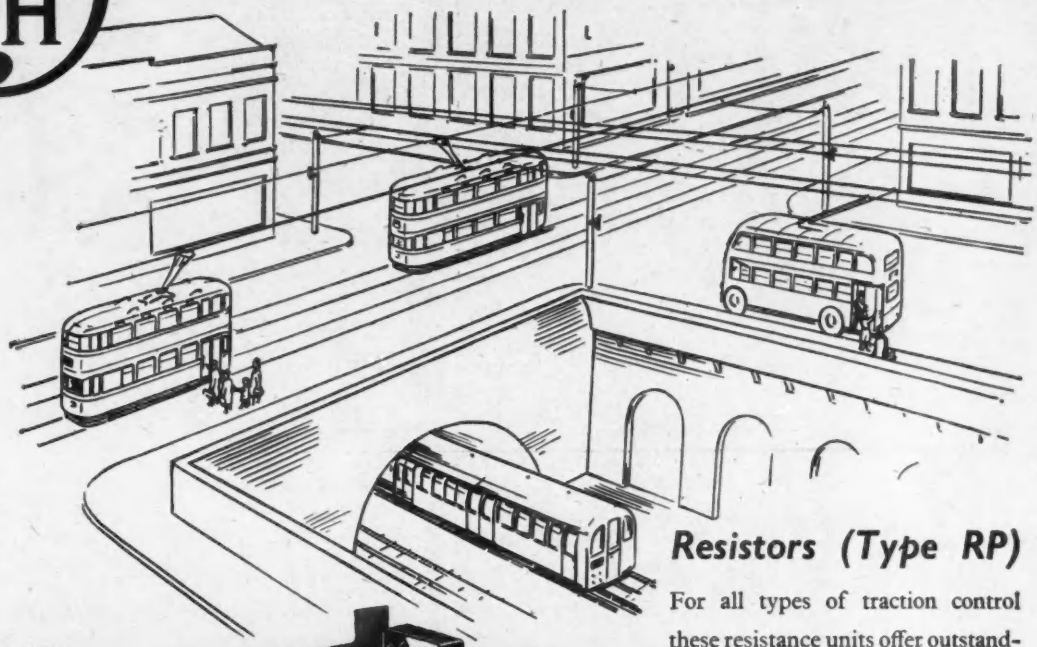

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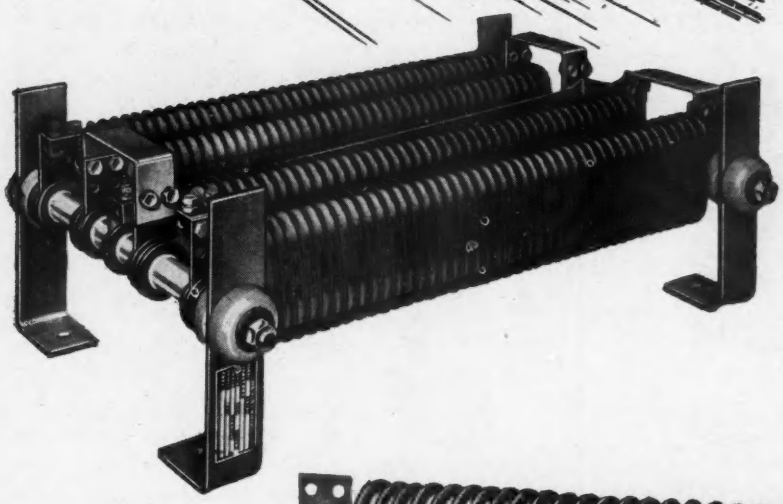

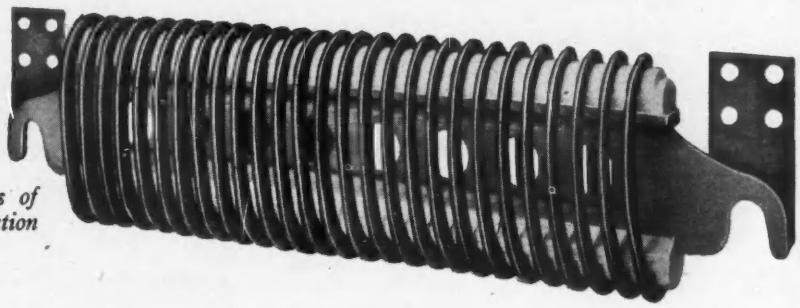

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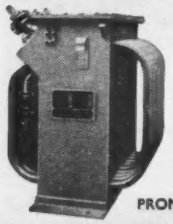

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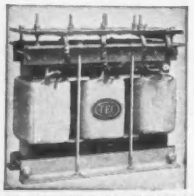

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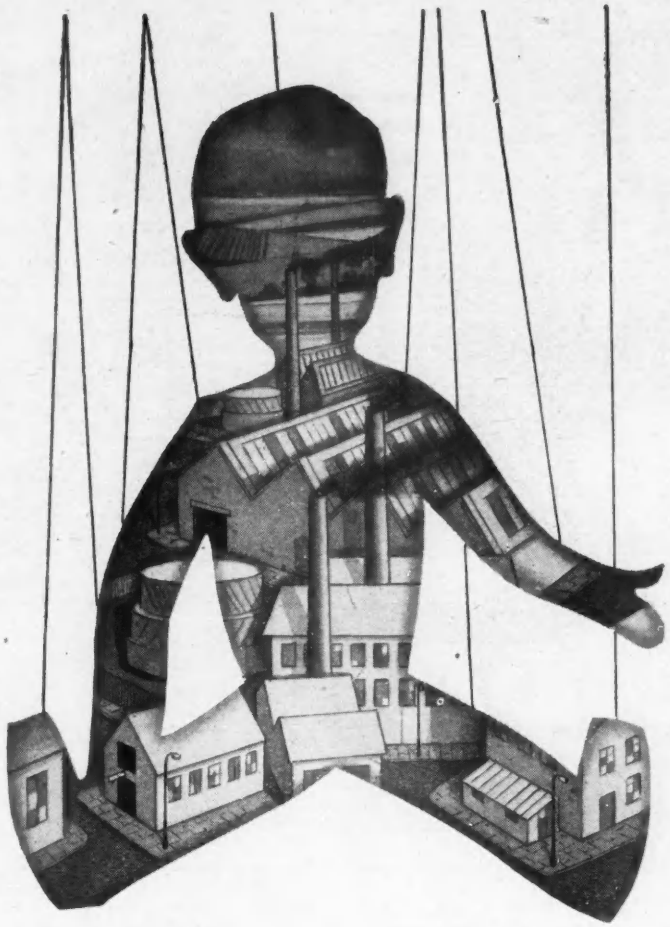

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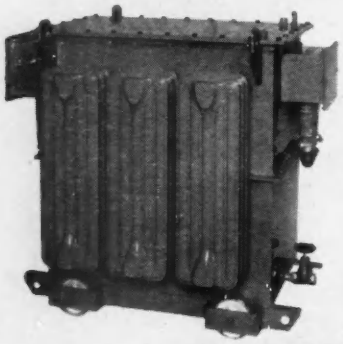

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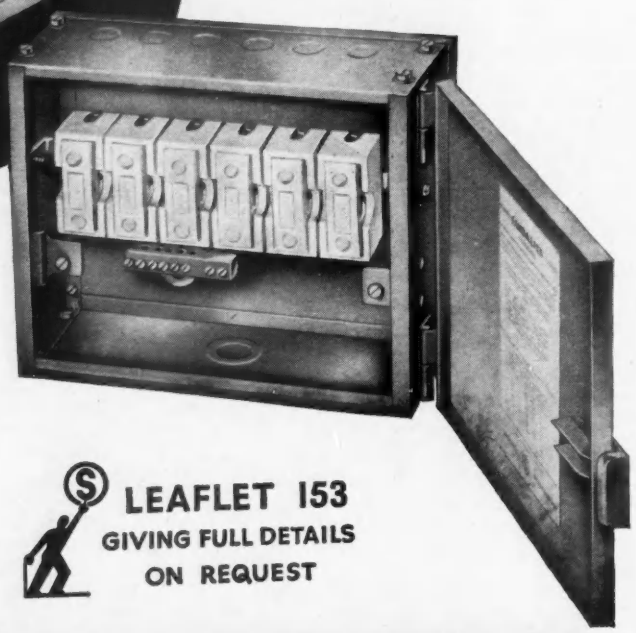

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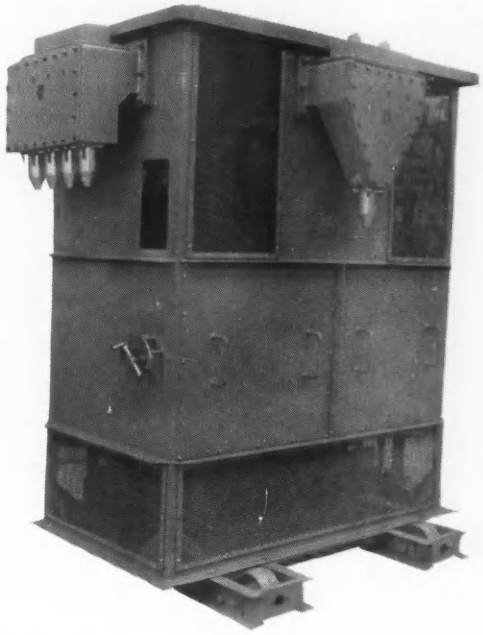

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